DRAGON USER



The independent Dragon magazine

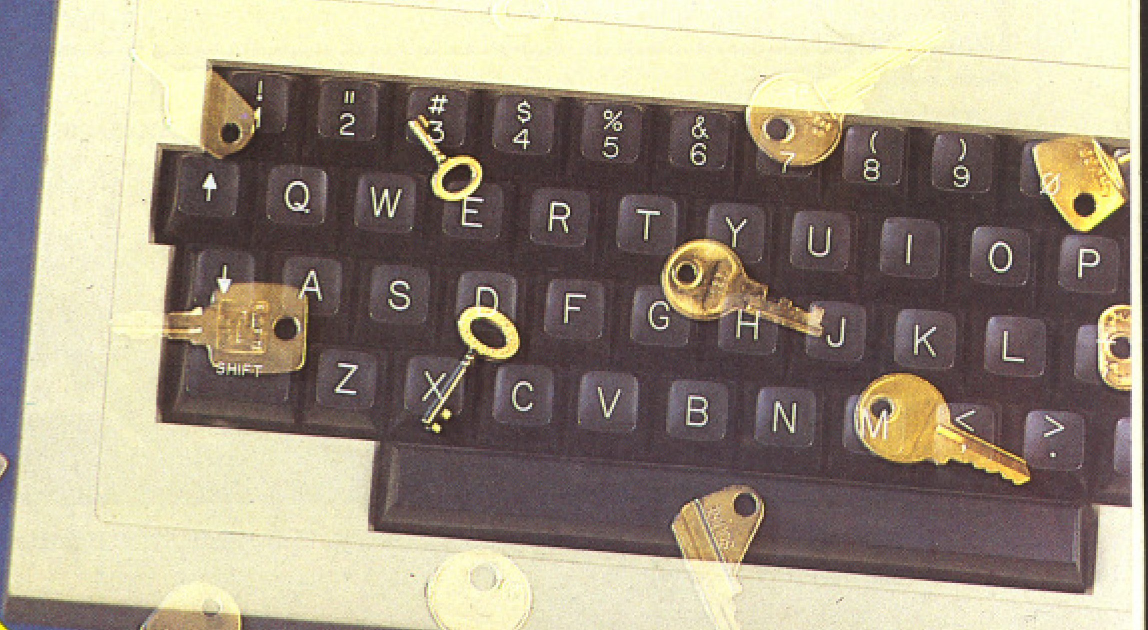
75p US$3.25 October 1984

Function keys to unlock your Dragon

Touchmaster — the inside story

Machine code special

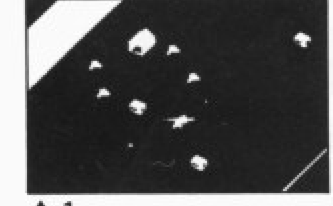
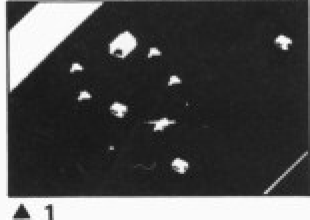
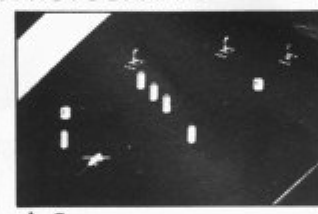
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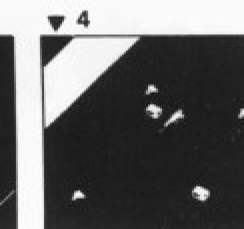
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ACTUAL SCREEN PHOTOGRAPHS

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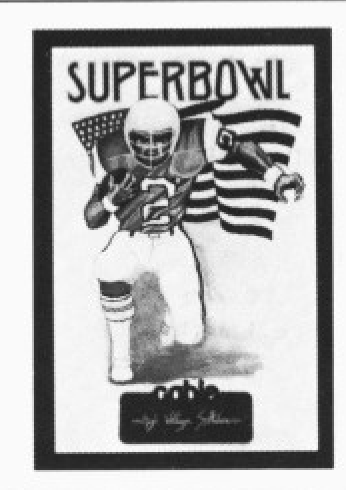
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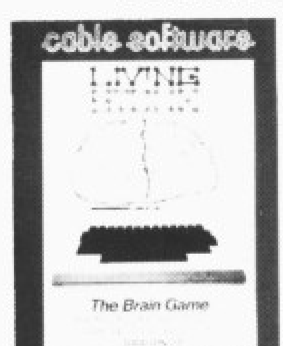


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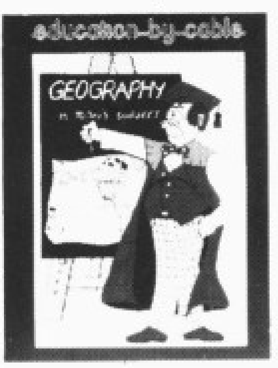
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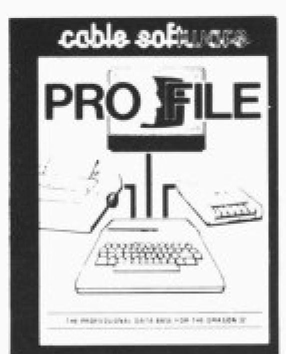
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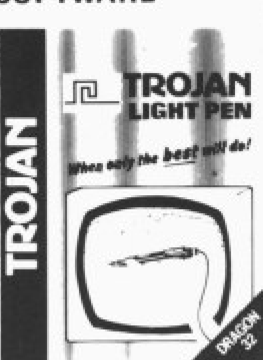
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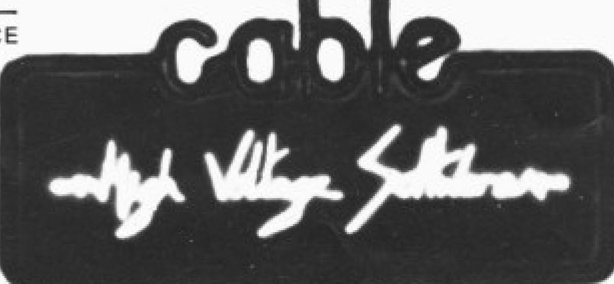

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Telephone number
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01-437 4343

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Assistant Editor
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How to submit articles

The quality of the material we can publish in *Dragon User* each month will, to a very great extend, depend on the quality of the discoveries that you can make with your Dragon. The Dragon 32 computer was launched on to the market with a powerful version of Basic, but with very poor documentation.

Every one of us who uses a Dragon will be able to discover new tricks and quirks almost every day. To help other Dragon users keep up with the speed of the development each of us must assume that we made the discovery first — that means writing it down and passing it on to others.

Articles which are submitted to *Dragon User* for publication should not be more than 3000 words long. All submissions should be typed. Please leave wide margins and a double space between each line. Programs should, whenever possible, be computer printed on plain white paper and be accompanied by a tape of the program.

We cannot guarantee to return every submitted article or program, so please keep a copy. If you want to have your program returned you must include a stamped, addressed envelope.

Contents



Editorial

SOFTWARE IS THE key to success for any home micro. The nature, quality, price and availability of software is crucial to prospective purchasers, as companies such as Camputers, Jupiter Cantab, Texas Instruments and Mattel have found to their cost.

Dragon's recent problems stem, at least in part, from a failure to attract the sort of software written for the Commodore 64 and the Sinclair Spectrum. Dragon's software was certainly available in quantity, but there were few games which captured the imagination in quite the same way as *Manic Miner* did for the Spectrum.

To be fair, some companies which specialised in Dragon software, notably Salamander and Wintersoft, produced some excellent programs. But, they did it with little help from Dragon Data, and they did not produce any blockbusters. Nobody would buy a Dragon simply in order to play a particular game, as some people might be tempted to purchase a Spectrum or Commodore 64.

Sinclair, while it has a rather ambivalent attitude towards third party software houses, ensured the production of high quality programs through its links with Psion, Melbourne House and others. Similarly, Commodore has brought out a vast range of interesting and innovative software, though it remains a hardware driven company.

However, with Eurohard moving Dragon's manufacturing base to Spain, it looks as though the supply of Dragon software is starting to dry up. Companies which specialise in Dragon software are fast converting their games to run on other machines. While some new games may appear over the next couple of months, the outlook after Christmas is distinctly bleak.

If Eurohard, Touchmaster or GEC want Dragon to maintain its share of the UK market, they will have to start producing some software soon. More importantly, they will have to convince the software houses that it is still worth their while developing new programs. As yet, they have not attempted to do so.

RETURN OF THE RING

THE RING OF DARKNESS PART II

At last the saga continues . . .

The Guardian of Shedir is defeated, the Hell spawned hordes of the Evil Sage lie at bay. Now Ringbearer, wielder of the Four Bright Rings, must face the greatest challenge: to return the Ring Of Darkness to its creators on the hidden planet Ringworld . . . And somewhere at the ends of time the forces of evil are preparing their revenge.

After one year of development, Wintersoft are proud to present the most sophisticated game ever created for the Dragon 32. Written 100% in machine code, RETURN OF THE RING is an astounding multi program blend of superb high resolution colour graphics and advanced routines that allow you to communicate with your computer in complete sentences. You will face challenge and excitement as you and your Ringworld companions travel a mysterious planet and brave the dangers of an amazing three-dimensional forest moon. An epic adventure unrivalled for its wealth of detail and diversity.

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Please note: RETURN OF THE RING is a complete adventure. You need not buy THE RING OF DARKNESS to play it.

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Letters

This is the chance to air your views — send your tips, compliments and complaints to Letters Page, *Dragon User*, 12-13 Little Newport Street, London WC2R 3LD.

Music, give me . . .

COULD you tell me if there are any firms selling an A to D converter for the Dragon 32 as I am interested in adding a musical keyboard to my computer?

M Webb
Hastings
East Sussex

. . . music

I HAVE a small synthesizer that can be controlled by an external control voltage.

Is it possible to connect this with the Dragon 32 so that the computer will play the synthesizer? If so, how would I go about connecting the two together, and would I have to write software specially for this purpose?

J A Gill
Brentwood
Essex

WE DON'T know of any suitable interfaces which would produce the 1 volt per octave signal required to control most synthesizers. Even if you could find one you would have to write your own software.

Unfortunately, the Dragon seems to have been passed over in the field of synthesizer control in favour of bigger-selling American computers (no names mentioned) which now have several interfaces available using the new MIDI music control protocols, or digital to analogue systems.

Routine expression

I THINK the following six-line subroutine may be of interest to Dragon Users, since it allows you to INPUT a simple expression, not just numbers.

Take the case where you are inputting a list of numbers (prices for instance) and you come to: 17 nurgles at £37.96 each. You either have to get your calculator out, or use INPUT N,V which means typing in endless "one comma this" and "one comma that" for all the single items.

This subroutine inputs either a single value or two values with a multiplier. The multiplier can be ★ or X as you like, and the numbers can be any valid Basic types, for example: 2E3X-6.09 (using X saves a shift). In the listing, $ = dollar.

```
1000 SUBROUTINE, INPUT
     WITH 'X' OPTION
1010 INPUT "(CAN USE 'X')";
     E$
1020 Z=INSTR (1, E$, "X")
1030 IF Z=0 THEN R=VAL (E$):
     RETURN
1040 ZL=VAL (LEFT$ (E$,
     Z-1))
1050 ZR=VAL (RIGHT$(E$, LEN
     (E$)-Z))
1060 R=ZL★ZR
1070 RETURN
```

Example of use:

```
10 PRINT "ENTER COST";
20 GOSUB 1000
30 SUM=SUM+R
40 PRINT R,SUM
50 GOTO 10
```

One word of warning: if VAL finds a non-numeric character, it gives up and returns the value so far without an error message.

J R Letheren
Bath

Cuthbert club

TWO of the main Dragon User Groups, Games and Computers of Wareham (who seem to have disappeared) and Dragon Dungeon (who are no longer trading) are now unable to provide the service previously available.

In the past many people have sent cash to user groups only to get little or nothing in return. We are prepared to offer A FREE OF CHARGE enrolment to The Cuthbert Club, which is Microdeal's own user group, to anyone wishing to join . . . all they need do is write to us for their free badge, quarterly magazine, hint sheets and so on. Our address is: The Cuthbert Club, Microdeal, 41 Truro Road, St. Austell, Cornwall PL25 5JE.

John Symes
Microdeal

Not cricket

With regard to the review of Tim Love's Cricket in the August edition of *Dragon User*, I'd like to point out that John Scriven is incorrect in stating that the player is restricted to playing matches between England and a World XI.

As the several thousand Dragon owners who have already taken the opportunity to wreak revenge on the West Indies will know, games can be held between clubs of the player's choice. In fact, one of the very attractive points of the game is that the save facility can be used to build a library of teams which can be matched against each other.

I think John may have been confused by the fact that if the player does not wish to take the time to name the teams and players, and give them batting and bowling skill points, the Dragon can be instructed to pick England and World XIs.

Harry Whitehouse
Peaksoft

String data

IN THE July issue of *Dragon User*, Pam D'Arcy wrote in complaining that she had used CHR$(34) (double quotes) in a text file, but was unable to reload the file as the quotes were interpreted at the start of a data field, rather than as characters in the field. Brian Cadge said that there is no simple way around this, but there are in fact two fairly simple methods.

As Pam mentioned, there is no problem if single quotes are used, but if double quotes are needed then the file should be read using LINE INPUT#−1, instead of the more normal INPUT#−1, just as you would when reading such text from the keyboard. All the same rules apply for LINE INPUT#−1 as they do for LINE INPUT being used as in normal.

Matthew Helliwell
Stoke-on-Trent
Staffordshire

On the box

I, LIKE many other Dragon owners no doubt, waited eagerly for the transmission of Dragon software on the ITV computer programme, Database. Unfortunately, I failed to record the programme and therefore missed the transmission.

If anybody did record the transmission, I'd be grateful if they contacted me at 0752 29788.

Colin Towns
Plymouth

ITT connector

SOME months ago I purchased an ITT Colour TV/monitor (model RL2310/M) which is an extremely fine unit, giving an excellent picture. I could, of course, have purchased a unit without the monitor facility at quite a saving in price, but I opted for the monitor for the better resolution that it undoubtedly gives.

I have tried in vain since the purchase to obtain the necessary connector to give me sound *and* vision from the computer. I can get the latter, but no sound. Consequently I have been forced to use the TV channel, but whilst it is still a good picture I am not getting the best use from my additional outlay.

I have telephoned both Dragon Data, who referred me to the monitor manufacturer, and ITT who referred me to the computer manufacturer!

Can you, or any fellow-reader, help me in my plight?

Gerald Woodward
Inkberrow
Worcester

Software Top 10

1	(–)	**Pedro**	Beau Jolly
2	(–)	**Hunchback**	Ocean
3	(5)	**Hungry Horace**	Melbourne House
4	(1)	**Buzzard Bait**	Microdeal
5	(2)	**Cuthbert in Space**	Microdeal
6	(4)	**Dungeon Raid**	Microdeal
7	(3)	**Mr Dig**	Microdeal
8	(–)	**Up Periscope**	Beyond
9	(–)	**Ring of Darkness**	Wintersoft
10	(–)	**Cuthbert in the Jungle**	Microdeal

Chart compiled by Websters Software

FACTS, FOLKS

During the last few years we have produced or licenced lots of software for the 6809 microprocessor. Most of the software has been advertised or reviewed at one time or another, but never all together — there was too much to say about each product. This month we are giving the "blurb" a rest and just printing a list of most of the software available from Compusense. If you want further details, write to us direct.

DRAGON/TANDY Software

	Cartridge	*Disk*	*Tape*
EDIT + (includes HI-RES)	34.50	24.00	n/a
HI-RES	25.30	n/a	n/a
DASM/DEMON	30.45	19.95	n/a
DASM	18.95	n/a	n/a
DEMON	18.95	n/a	n/a
DECODE	18.95	12.00	n/a
DYNAFAST	29.95	29.95	n/a
DYNAMISER	n/a	5.99	5.99
DYNAXREF	n/a	5.99	5.99
GRAPHDRAWER	n/a	n/a	19.95

DASM Source Programs — Program + Source code for DASM.

	Tape
Vol 1. Dissasembler	5.99
Vol 2. Game of life	5.99
Vol 3. Epson Scren Dump	5.99
Vol 4. Seikosha Screen Dump	5.99
All four Volumes	14.99

Postage on above software — 50p per order.

TANDY COLOR versions are available — but enquire first plese!

Books and extras

6809 Assembly Language — Leventhal	13.20 + 1.30 p&p
Programming the 6809 — Zaks	12.50 + 1.30 p&p
*Introducing Dragon m/c — Sinclair	7.95 + 0.50 p&p
Advanced Sound/graphics — Brain	5.95 + 0.50 p&p
*Dragon m/c — Jones/Cowsill	6.95 + 0.50 p&p

*These books contain DASM/DEMON examples.

Monitor/Sound lead	4.31 incl p&p
Dragon Dust Cover	2.99 incl p&p
Dragon printer lead	14.95 incl p&p
DRAGON Disk drives	*Enquire for prices*

DASM/DEMON, EDIT + are available from larger branches.



FLEX/OS9 Disk Software

FLEX is available on a number of hardware systems including the DRAGON and TANDY COLOR COMPUTER. All the software shown here is fully compatible with these systems. More to follow soon!

Flex Operating System, Ed/Asm for DRAGON	86.25
Flex Advanced Programmers guide	11.50
TSC DEBUG package	74.75
TSC XBASC precompiler	51.75
TSC Utilities	74.75
TSC PASCAL	230.00
Super Sleuth Dissasembler 68xx/6502 + source	97.75
Cross Assembly Macro Sets	51.75
6502 Simulator + source	97.95
6800 Translator + source	97.95
Strumacs structured programming macros	40.25
DYNACALC FLEX	172.50
COBOL Compiler	115.00
DYNAMITE 68xx dissasembler OS9	172.50
Intol "C" compiler, linker	431.25
(also available for IBM PC and UNIX based mini/mainframes)	
Lucidata Pascal	103.50
Lucidata Xref	11.50
Lucidata Copycat CP/M copy routines	28.75
Stylo/mail/Spell (DRAGON only!)	172.50
DYNAFORM	57.45
DYNASPELL spelling checker	68.95
DYNASOFT PASCAL + runtime source	103.44
DYNASOFT "C" compiler	68.94
Windrush XMACE	55.20
Windrush "C" Compiler + link loader	189.75

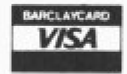
Flex Operating System	40.25
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TSC XBASIC interpreter	105.80
TSC Sort/merge package	74.75
TSC Text Processor	74.75
TSC Relocating Assembler/link loader	172 50
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6805 Simulator + source	97.75
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6809 PIC/PID translator	97.95
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Stylograph w/p	295.00
DYNASTAR word processor	57.45
DYNASTAR/DYNAFORM	114.89
DYNASOFT PASCAL	68.94
KBASIC Compiler	218.50
Windrush MACE	43.70
Windrush PL9	112.70

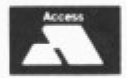
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Please rush me _____ (qty) adult tickets at £2 each and _____ (qty) tickets for under sixteen year olds at £1 each for the 6809 colour show. I enclose cheque to the value of £_____

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6809 is the registered name of Motorola Ltd.

Eurohard plans October launch

SPANISH firm Eurohard hopes to begin production of the Dragon this month at its plant in Caceres, Spain. The company, which has bought Dragon Data's assets "lock, stock and barrel" according to ex-Dragon Data managing director Brian Moore, has the rights to the Dragon's plant, machinery and intellectual property (the right to new products).

The company is believed to have acquired the assets for £1 million. A team of Dragon Data employees are currently in Spain helping to set-up production facilities. Eurohard is a new company, privately owned, that has been set up to manufacture computers in a regional development area in Spain — it thus has many similar parallels to Dragon Data.

The company will start production of the 32 and 64 and is currently "finishing perfecting" the design of the Professional according to Senõr Lopez the man in charge at Eurohard's plant in Spain. Eurohard also has the rights to Dragon Data's share in the GEC Dragon MSX machine which it is also perfecting and will be manufacturing next year, although it is now thought that GEC has not yet signed a licensing arrangement with Microsoft.



Production of the Dragon has moved to Spain

The final deal that the receiver, Robert Ellis of accountants Touche Ross, set up is a tripartite arrangement that sees the production of the Dragon move to Spain, the marketing in the UK being taken on by GEC and the support of the Dragon being undertaken by Touchmaster — the UK company set up by ex-Dragon Data employees located at the Dragon plant in Port Talbot.

Eurohard, believed to be the first micro manufacturer in Spain, had prior to the receiver being called in, actually signed a licence with Dragon Data to manufacture the Dragon in Spain for the Spanish home market and Spanish speaking countries, including Central and South America. It now has the sole rights to manufacture the Dragon, which Touchmaster will be responsible for exporting initially to all territories other than Spain and Italy.

GEC has signed a distribution agreement to manufacture future Eurohard Dragon products in the UK through GEC Radio and Television at Sefton Park. GEC will also be responsible for selling off Dragon Data's stocks of the Dragon 32 and 64 in this country, though at press time the company had still not come to a deal with the receiver over the price it would have to pay for the stocks, and therefore couldn't comment on its plans to market the Dragon.

Touchmaster will be operating a telephone answering service and a Dragon mail order business at the Dragon Data plant in Port Talbot. The telephone number will remain the same — 0656 744700, though the address to write to has now changed. All enquiries should be directed to Touchmaster at PO Box 47, Port Talbot SA13 1ZQ. The company will also be contacting software authors with a view to marketing products on behalf of Eurohard.

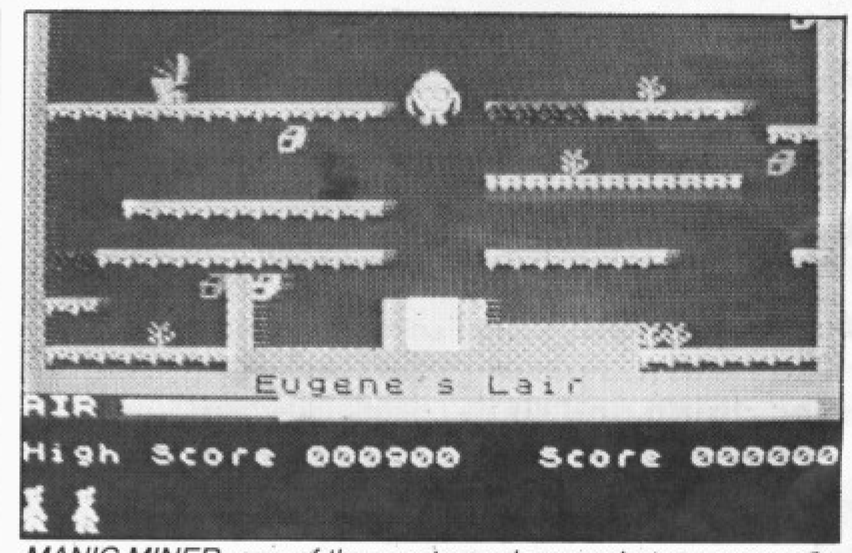
The manufacture and marketing of the Dragon in Spain will be supported by a television program to be run on Spanish television along the lines of the Computer program shown on BBC television in this country.

Court action

SEPARATE legal proceedings in the High Court were instituted both for and against Microdeal in London recently.

The American company Activision instituted proceedings against Microdeal on the grounds that Microdeal's Cuthbert in the Jungle was a copy of Activision's game Pitfall. The company sought an injunction preventing Microdeal from selling Cuthbert in the Jungle, and the proceedings were resolved when Microdeal gave an undertaking to the court that they would not make any further copies. Microdeal obtained a license to market the game from Tom Mix Software in the US, but when it compared its license with Activision it transpired that Activision had acquired a license first, and so Microdeal withdrew its license.

In other proceedings, Microdeal sought and gained an injunction againt a Dr Mohammed, who it was alleged, in conjunction with his 14 year old brother, ran a tape copying operation from four different addresses in the Blackburn area. The tape piracy racket involved thousands of pounds worth of Dragon software being sold through classified advertisements in computer magazines. Games such as Softek's Ugh and Microdeal's Frogger and Cuthbert series were being copied on a large scale and offered to Dragon owners at a fraction of the retail price.



MANIC MINER, one of the most popular arcade-type games, in which you have to negotiate a series of interlinked caverns, collecting treasures and avoiding nasties, is on the way for the Dragon. The game (Spectrum version pictured above) is to be released by Software Projects for both the Dragon 32 and 64. The conversion contains most of the graphics and screens obtainable on other versions although it will be in black and white. Manic Miner was responsible for spawning a whole new generation of similar styled games on the Spectrum. The game should be out by the end of September.

Dragon fair on the way

AT LONG last Dragon users will have a show of their own. The 6809 colour show will be held on Saturday and Sunday, 17 and 18 November at the Royal Horticultural Hall, Westminster.

The show promises to be a major event for Dragon owners, with a number of familiar names promising to be there. A Microdeal spokeswoman said that the company will have "a major position at the show" adding that it was going to be "the biggest thing for 6809 users since sliced bread."

Compusense will be displaying Flex on the Dragon and according to Ted Opyrchal the show should be a "roaring success". Salamander promise to be there as do Cablesoft and Peaksoft who will be holding a competition on their stand — there will be a prize to the top scoring batsman in Peaksoft's cricket game for the Dragon 32.

According to Mike Greenfield of Computer Marketplace, organisers of the event, Cotswold Computers, Channel 8 Software, Duckworths, Ikon Computers, Microcare, MST Consultants, Trojan Products and Tandy have all booked places and many more companies have promised to be there.

The show will enable Dragon users starved of software and other products to see what is available for their micros. Brian Moore of Touchmaster said that GEC/Eurohard or Touchmaster should be there. Sunshine Publications — publishers of this magazine, will also have a stand. For further details contact Mike Greenfield, Computer Marketplace, 20 Orange Street, London WC2H 7ED.



Look out for Dragon User at the fair

Imagine that!

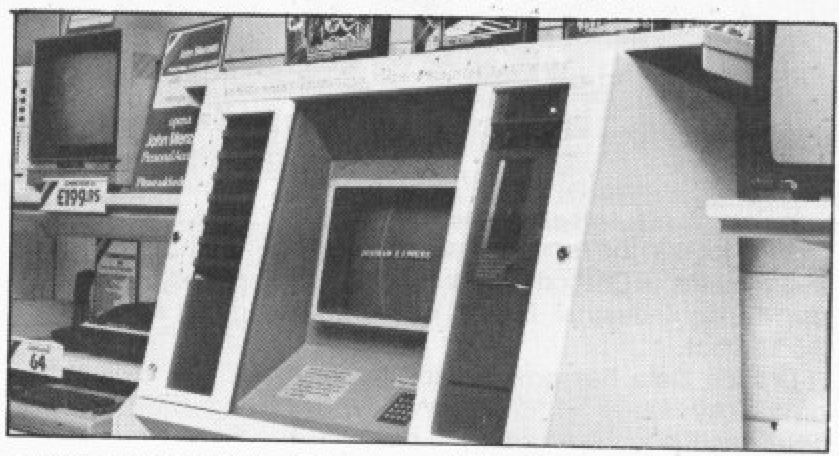
FOLLOWING the news that Imagine had called in the official receiver, after failing to pay magazine publishers VNU £10,000 within a seven day limit imposed by the High Court in London, Beau Jolly announced that it had acquired Imagine's existing stock.



The company, which was formed at the end of last year to seek licences to market products from a number of software companies, had in fact been distributing software for Imagine. It has now gained the rights to sell Imagine's stock and is offering Dragon users a Dragon Value pack for £14.99. The pack consists of four games for the Dragon — Arcadia, B C Bill, Cosmic Cruiser and Leggit — all of which usually retail for £5.50 each.

For further details contact Beau Jolly at 19A New Broadway, Ealing, London W5.

Electronic software



JOHN MENZIES is to be one of the first retailing groups to introduce the Electronic Distribution of Software (EDOS) system into its shops. The system, developed by Program Express, allows games, educational, home or business software to be transferred on demand to cassette, cartridge or disk at the time and point of sale. The machine that allows this (pictured above) give users information on the "top 10" best selling software and can also present reviews on certain programs. All the popular micros are catered for, including cassettes for the Dragon.

Aids to learning

A NEW RANGE of educational software for the Dragon 32 and 64 is being launched by Abacus Software. Mike Madden of Abacus said that the company is pulling out of games software and concentrating on the business and educational fields.

Designed by teachers, the new range of programs are a revision series for GCE 'O' level and CSE examinations. There are seven titles, covering Biology, Chemistry, Computer Studies, Geography, History, Maths and Physics. Each tape retails for £12.95 and consists of four programs.

There are nine topics on each program plus a tenth which examines you on the previous nine. Graphics are also included.

For further details contact Abacus at 21 Union Street, Ramsbottom, Nr Bury, Lancashire. Still on the subject of educational software, news of a different sort — a full-scale withdrawal from the Dragon — comes from Colin Munn of Garland Computing. Garland, who planned to launch a range of software converted from its BBC programs (see *Dragon User* May) has decided to cut its losses and drop the Dragon altogether.

Bargain programs

DELTASOFT is hoping to sell a range of software at inexpensive prices for the Dragon 32. The first program is entitled Megamaze and retails for £2.50. Written in 100 per cent machine code this arcade-type game puts you in search of treasure. The screen scrolls either way as you remain in the centre of the maze looking for the hidden cache.

The program is accompanied by a utility (on the reverse side of the cassette) which is aimed at correcting the bug in the debounce routine of the Dragon's keyboard.

The utility (which is free with the game) enables the simultaneous pressing of keys — allowing very fast typing on the keyboard. Further games from Deltasoft will depend on the response to the launch of these two titles. John Lange of Deltasoft said the relatively inexpensive pricing policy is a result "of perennial complaints in the letters pages of computer magazines about software prices." Details from Deltasoft at 40 Windsor Road, Doncaster DN2 5BT.

Boots are also selling inexpesive software — a range of titles for the Dragon and other micros are being sold at half price.

Touchmaster takes off

***Gordon Ross** looks at the new set-up at Dragon Data*

AN EMPTY warehouse, a few framed pictures of old software covers and the Dragon logo at the receptionist's desk is all that remains of Dragon Data's presence at the Kenfig Industrial Estate in Margam, Port Talbot.

Dragon Data has now ceased to exist, or, strictly speaking, the company has been handed to the liquidator to pay-off the creditors. In its place is a complicated tripartite arrangement designed to support Dragon users and continue with the production of the machines (see page 8 this issue). Central to this arrangement is the role of Touchmaster — a company set-up by ex-Dragon Data chiefs Brian Moore and Richard Wadman and occupying the old Dragon Data premises at Margam in Port Talbot.

Touchmaster is a new high technology company backed by Prutech, the investment arm of the Prudential Insurance group, and largely comprising ex-Dragon Data employees. Its role, as far as the Dragon is concerned, is an unusual one, coming somewhere between that of Eurohard and GEC. It will neither be manufacturing Dragons, nor marketing them — its stocks having been shipped to Spain and to GEC's warehouses in Sefton Park.

Sitting in a large conference room, Brian Moore, now managing director of Touchmaster UK, outlined the role of his new company, and was quick to point out that Touchmaster is not solely concerned with the Dragon.

Touchmaster has two purposes, a residual role — to continue to support the Dragon, and a new role as a development company. Touchmaster's support is linked to the roles of Eurohard SA — the company which will be manufacturing Dragons in Spain, and to GEC, who will be marketing Dragons in this country.

Initially Touchmaster will "assist with the move to Spain and help set up the production facility there". In this connection, a team of four Touchmaster employees are going to Spain to lend assistance to their Spanish counterparts. Brian envisages spending some time there himself, but only on a temporary basis.

Once this initial stage has been completed, Touchmaster will "provide ongoing support to Eurohard and will assist, where required, in any new product design." It will also be responsible for exporting Dragons to all territories other than Spain and Italy.

In the UK, Touchmaster "will assist the GEC marketing effort as required by GEC," and will sell Dragon software and provide support such as a telephone answering system, mail order business and so on. It has not been decided if Touchmaster will continue to service Dragons, though people who buy their Dragons from GEC will have them serviced by GEC. Brian said he hopes to continue to service existing Dragons, though Touchmaster may experience logistics problems such as obtaining spare parts and supplies.

There is lots of feeling for the Dragon at Touchmaster — a "labour of love" was how Brian described it — and a new mail order address has been set up to deal with Dragon orders.

A labour of love

Brian did not dwell on the reasons for Dragon Data's failure, as he was anxious to get on with discussing Touchmaster's future. However, he did admit that the Dragon 64 "was essentially late to the market. If it had arrived at the right time then it would have been more acceptable."

Brian, who was brought in to Dragon Data on secondment from GEC as part of a rescue package from the then ailing company, has learnt a lot from the troubles. He said the company experienced many problems operating in a young, relatively unsettled market and that it was inevitable that some companies would go — unfortunately Dragon was one of them. "Smaller companies either go out of the market or find a specialist niche" — which is where Touchmaster comes in to the scheme of things.

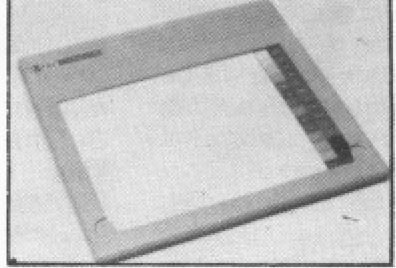
The Dragon side of Touchmaster's activities is secondary to its main purpose. Brian is keen to point out Touchmaster's main role: "The immediate priority is to make Touchmaster a successful company and to help Prutech bring new products into the market in the most effective manner possible."

Once a thriving factory, Dragon Data's manufacturing plant now lies empty

Touchmaster hopes to do this by the launch of the Touchmaster pad at the *PCW* show in September. The pad — a touch-sensitive surface, designed, developed and manufactured in Britain, is being manufactured for all the popular home micros — the Commodore, Sinclair, BBC and the Dragon. Interfaces are also on the way for the Amstrad and MSX.

Retailing at £149 the pad "provides a way of communicating with the micro other than through the keys". Brian believes that the pad will "change people's attitudes to software in particular" and lead to the spawning of a whole new development in software, using overlays rather than the whole keyboard.

The pad comes complete with graphics package, interface and power pack for each micro. Touchmaster will sell software ranging in price from £6.99 to £20 and will be responsible for its own marketing. The company has the world licensing and sub-licensing rights for the manufacture of the pad, which was initiated by Information Entry Limited of Reading and is being production engineered by Touchmaster.



The grafpad

The company is actively encouraging software companies to produce software for the pad. Touchmaster has about 90 games and utilities for the pad which Brian says is not a totally mass market product — rather, users will want it to complete their range of peripherals. As users change their micros they will be able to take the pad upmarket with them — all that is needed is a new interface.

Touchmaster is looking at other products which might not be for micros at all says Brian, who points to the need to diversify into other product areas. Brian, and most of the employees at Touchmaster, are putting all their energies into the pad. An extra 20 to 30 employees may be needed in the run up to Christmas. At present, Touchmaster has 35 employees and only a handful of these will be dealing with the Dragon side of the business.

Touchmaster's new mailing address for Dragon products is: Touchmaster, PO Box 47, Port Talbot SA13 1ZQ. The telephone number will remain the same as Dragon Data's old one, namely: 0656-744700. A second Post Office box number has been set up for trade enquiries concerning the Touchmaster pad and any new products the company may launch: Touchmaster Limited, PO Box 3, Port Talbot SA13 1WH. The telephone number for this side of the business is 0656-744770. ■



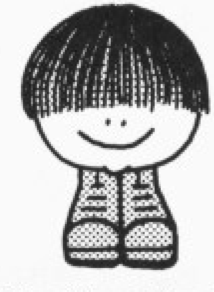
NEW

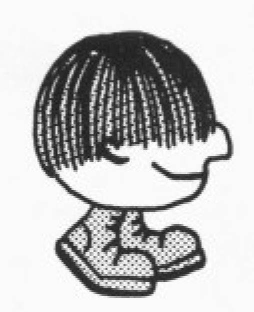
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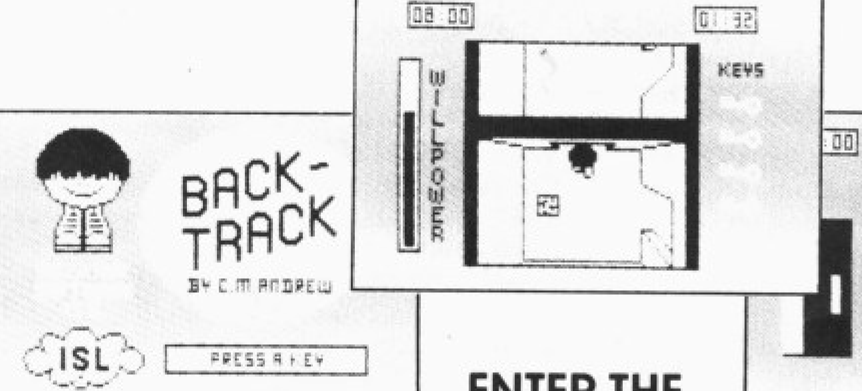






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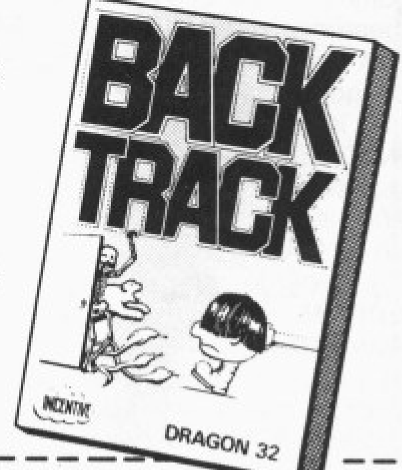
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Run with ROM

John Scriven reviews Bug Zapper, an aid to instant program running

ALTHOUGH DISK systems are now available for the Dragon, and most users have come to terms with the cassette operating system, it's useful on occasions to be able to switch on and have a program up and running instantaneously. The only way to achieve this is to have your program held in ROM as an alternative to Basic on power-up. Dragons have a suitable interface in the cartridge slot on the side, but only a limited number of manufacturers have taken advantage of this fact.

If you peep inside a Dragon cartridge, you will see it contains one or two large chips in sockets. These are often a version of ROMs called EPROMs, (Erasable Programmable Read Only Memories) and they contain a machine code program. EPROMs are programmed by transferring a program byte by byte into the chip at the same time as subjecting each location in turn to a voltage of about 20v. Once the program is inside, it is remembered, even when the power is removed, and it can be treated as a ROM. (Many early versions of computers, such as the BBC and the Oric had their operating systems and Basic on EPROMs.)

Erasable

With a ROM or PROM, you are stuck with the code written on it — sometimes called firmware, as it's between soft — and hard-ware — but the EPROM can be erased by shining a strong beam of ultra-violet light on to the chip and it can then be re-programmed.

What the man-in-the-street thinks of as a chip is of course simply the packaging, and the real chip hides inside. EPROMs have little windows on their upper surfaces, so that light can enter. Programmers usually stick a paper circle over the window to label the chip, and also to prevent ultra-violet light from entering. Although it's unlikely to happen, leaving an EPROM in bright sunlight for a long time could possibly erase your precious program.

Like all chips, EPROMs have identification numbers and these denote the memory size. For instance, one of the most common is the 2764 from Intel which has a memory size of 64K. This is 64K bits not 64K bytes, so in an 8-bit machine like the Dragon, you can store a 64 divided by 8, that is 8K program, The largest EPROM available at present is the 27256, which can store 32K bytes in one chip; as their price is something in excess of £100, they are out of reach of most programmers.

In order to "blow" or program your own EPROM, you need the necessary hardware including a socket for the chip, and you need the driving software to transfer your program and verify it.

Windrush Micro Systems, manufacturers of the Mace editor/assembler, have incorporated the hardware and software into a very neat package that plugs into the cartridge socket on the Dragon. A little larger than the normal cartridge, this is still fairly compact, measuring 16 × 10 × 2 cm, encased in hard black ABS plastic. On the upper surface are two LEDs, 14 colour-coded dip-switches and a ZIF socket. (This stands for Zero Insertion Force, and clamps the legs with tiny brass plates so you don't bend them.)

When switching on, there is no need to connect a separate power lead, as the unit is fed from the Dragon. Simply enter *EXEC 49152 and the start-up menu appears on the screen. The choices available are:

0) Fill buffer area with a hex character
1) Move data within the buffer
2) Examine/Change the buffer
3) Formatted dump in hex and ASCII
4) Checksum of buffer
5) Copy EPROM into buffer
6) Verify EPROM against buffer
7) Program EPROM from buffer
8) EPROM type selection menu
9) Save/Load (Cassette)
10) Return to Basic

A normal sequence of operations might be as follows:

A) Write program using assembler.

B) Debug and test program.

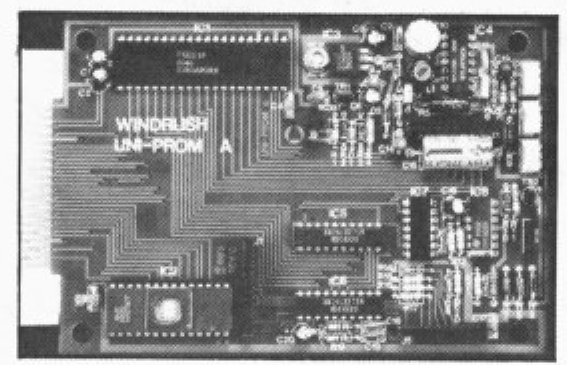
C) Save program on cassette.

D) Switch off and plug in EPROM programmer: switch on.

E) Select menu option 8 and enter the type of chip you're using. The screen shows a picture of the dip-switches in their correct positions for that particular chip.

F) Select option 9, save/load from cassette. This produces another menu that allows you to load the buffer with your program.

G) Select option 3, a formatted dump, and take a print-out of the buffer's contents. This not only shows the hex contents in rows of eight, but also the ASCII equivalent of the code. Any text or key-words can be read from the screen.



Inside Windrush's Bug Zapper

H) If everything is satisfactory, select option 7, insert a blank EPROM, and sit back. One of the LEDs lights up and the program is burned in.

One way to speed up entry is to use IPA (unfortunately this doesn't stand for India Pale Ale in this case, but INTELigent programming algorithm!). Normally programming involves applying a 50 milli-second pulse to each location in the chip. In programming a 1K device, this means that pulses are applied for 1028 × .05 seconds, that is 51 seconds in all. An 8K device takes seven minutes to program, and so on.

Before programming, all the locations in an EPROM are set to hex FF, so it's possible to shorten programming time by skipping over any cell that needs to end up as FF. Intel also noted that the majority of cells didn't actually need 50 milli-seconds — 8 msecs would do adequately, so they developed their INTELigent programming algorithm which cashes in on this fact.

Supplied with programming pulses every millisecond, the location is checked against the data to see if it has "taken". If it hasn't, the pulse is repeated. If it has, the program moves on to the next location. This means a considerable saving in programming time: a 2764 takes seven minutes normally, and typically 1 min 15 secs using IPA.

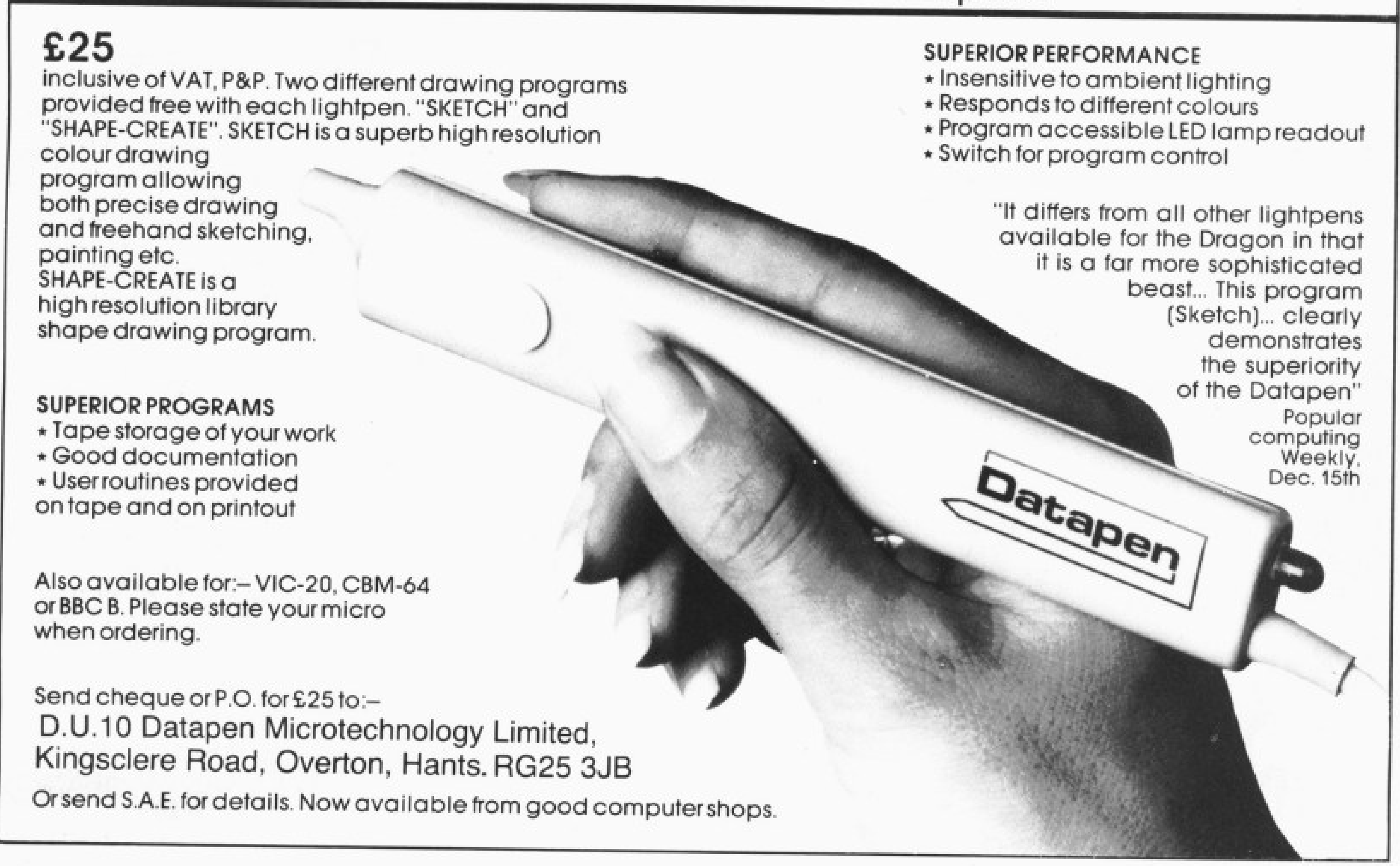
Although there may appear to be a lot of menus and keyboard entry, the system is nearly foolproof, and most entries have sensible default values (if you don't call up the chip selection menu, the program assumes you're using a 2764). The programmer also checks to see if the EPROM is totally blank before you start and will detect suspect chips.

Verification

When you've finished programming, you can verify the contents of the new chip against the contents of the buffer by choosing option 6 from the main menu. In this operation, the contents are compared byte by byte and locations that do not agree are shown on the screen. If all is well, a check-sum is made and the EPROM can be removed when the LED goes out.

The documentation is enclosed in a 36-page spiral bound A4 folder and is easy to understand. It goes through each of the options in some detail, and technical notes are also available. The package is neatly presented and simple to use. It compares favourably with those on the market for other machines, and indeed is a lot easier to use than another firm's BBC model I usually use.

As well as being an excellent development tool, the Bug Zapper provides one way of examining the contents of ROMs and EPROMs, even those designed for use with other computers. If you are using the Dragon for machine code development, then this would be a useful addition, even though it appears rather expensive at £79.95. If you don't yet have an assembler for your Dragon, then better value is provided by the version that includes the MACE assembler at £89.95. ■


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Educational enlightenment

***Mike Harrison** steps into the educational arena*

WHENEVER SMALL children play at "school" we know what to expect. The fantasy of dunces caps and children bring chased around the classroom by cane-wielding teacher-monsters is far too powerful an image to be deflected by reality.

Kindly, helpful folk who go out of their way to care for and help their students to make the learning situation a successful and rewarding one never get a look in. This type of "school-fantasy" also often seems to infect the minds of programmers putting together educational tapes. Hence the host of "testing" programs we saw back in February when we last looked at educational programs available for the Dragon 32 (*Dragon User,* February). We saw quizzes galore in almost every guise (some with the wrong answers) and a collection of weak and inadequate packages which were more harmful in the pursuit of children's learning and understanding than of any help.

Fantasy

The idea that children should spend their time in school absorbing and failing to absorb meaningless dates and formulae has never been so firmly scotched as now with the dawn of the era of information technology. The enquiring mind, the versatile child and investigative student are the concepts of education today. The contribution that home computers can make in this direction is tremendous — as long as we can keep away from fantasy-nightmares.

If we are then to avoid the worst of the misconceptions of how children learn and what they need to know, what is the best approach? Perhaps teachers and programmers might work together to produce fast, exciting and suitable material. This is the philosophy behind Ampalsoft's Cheshire Cat Educational Series.

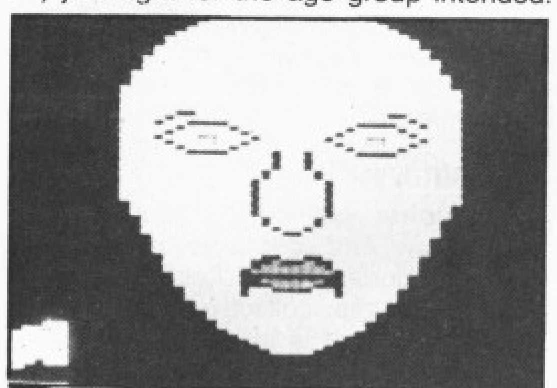
Super Spy is an excellent example of what such co-operation can produce. It consists of four different programs each dealing with aspects of war-time Britain. Combining video game skills and adventure excitement in one game.

As a German spy you have to take in briefings on blackout Britain, its peoples, leaders and general activities in order to survive interrogation on parachuting into Scotland. Your luck depends also on your skill as a 'chutist, shooter and code-breaker and will affect your chances of delivering a secret message in 10 days, 600km across Britain. The package is very cleverly devised ensuring come-again motivation using all the hi-res colour and animation that the Dragon is capable of.

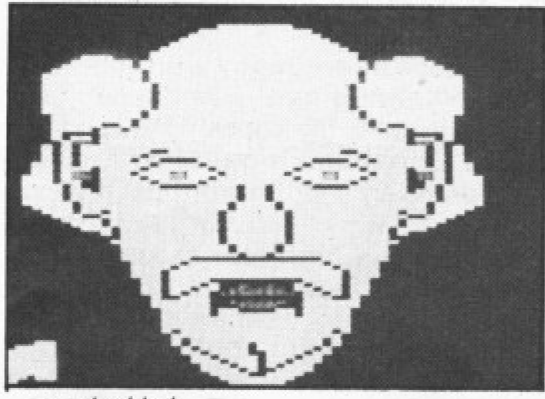
This also can be said for Ampalsoft's two **Maths revision** packages which contain a total of eight large programs full of the traditional subject matter studied for "O" level. Mixtures of text and graphics with worked examples and diagrams are shown on the PMODE 4 screen.

In the worked example parts the question is unravelled and the answers appear slowly on the lower half of the screen. This gives the user a sporting chance to have a stab at the method before all is revealed, compared to say a book where the brain needn't be engaged at all because the answer is there as you read.

Ampalsoft has not forgotten the younger child either. Maths 1, which was one of the better programs in my last review, has now a follow-up in Maths Level 2 (age 6-7). They have pitched these exercises (19 in all) just right for the age group intended.



Facial features can be added . . .



. . . and added



. . . and completed in Facemaker

Whereas so many programs concentrate on testing based on the four rules of number without any rationale, Ampalsoft go through "missing numbers", recording charts, simple place value and the concept of differences. At each stage help is given in a visually pleasing way if required and counting strips and abacus beads abound.

Dragon Data also has a series of tapes to teach young children various basic concepts. Written by Applied Systems Knowledge they continue the tradition established by the publication of the excellent **Hide and Seek** last year. **Facemaker** sets the child the task of teaching his Dragon about the main features of the face of a friend or relative. Based on this information the computer selects from around a million different combinations of features to draw a face on the screen.

You can experiment (give mum a beard) and dress your friend in a variety of headgear. The aim, of course, is not to make children into fashion experts or graphic artists but to make them observe, consider, judge the features of their friends — and most of all read and respond to the written word.

Lower case letters are drawn on the hi-res screen fitting in with children's school reading experience and the program's contribution to understanding questions is valuable: "Are Mary's eyes small, large, smiling or mean?" The 6 to 9 year old's response will mean something to him in that as a direct consequence some eyes are drawn on the screen face. The accompanying booklet gives other educational spin-offs from the use of this great little program both at home and at school.

Impressive

Brock the Badger is the star of **Shape-Up** a program for infants dealing with simple shapes — the square, circle, triangle and oblong. ASK have produced some brilliant graphics and their attention to detail is second to none. Mr Brock has to help with some infilling in a builders yard and each shape must be matched to its correct place.

Mr Brock also plays basketball under the child's control (sorting large and small objects) and meets a disappearing magician who demands that the badger remembers a missing shape hidden in the box. Lastly the child has to help Mr Brock build a house, train or rocket with large and small shapes and when completed the animated shapes bring the scene to life.

Many educational principles are included in this tape including the presenting of shapes to be matched at different angles so that true internalisation of the concept of a "square" has to take place before it can be recognised as matching a "diamond". This, along with the graphics and game-appeal, makes this program highly recommended for children from three years on.

The plethora of tables-testing programs around, most of which are based on:

```
10 A=RND (10): B=RND(10)
20 PRINT A; "x";B;"=";:INPUT Z
30 IF Z=C GOTO 100
40 GOTO 200
```

▶

with some rewards and punishments, made me wary of Dragon Data's **Tables Adventure.** I needn't have been. It consists of four games each one harder than the last and using a variety of strategies to keep children's interest and get them to appreciate the qualities of numbers when combined together.

What do you find at the end of a rainbow? Well, a pot of gold of course, if you can make your puck bounce along the wall to hit the right target. The size of its bounce depends upon you hitting on the tables solution. Otherwise ASK has devised a mean little creature — halfway between Cuthbert and Gollum who sneaks out and steals the gold away.

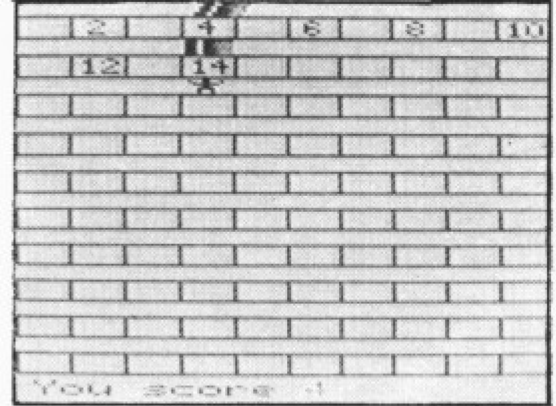
Number families is another game in this program and looks to the factors of numbers below 60. You choose a number to score and the micro knocks out that number and all its factors (that is, if you choose 18 you score 18 but also lose 18, 9,6,3,2 and 1). You can, however, only choose numbers which have a factor left so the game also involves investigation and strategy as well as knowledge of tables. The whole package resembles the way tables are tackled in school. It emphasises the relationships between numbers rather than the parrot-like responses of tables-chanting.

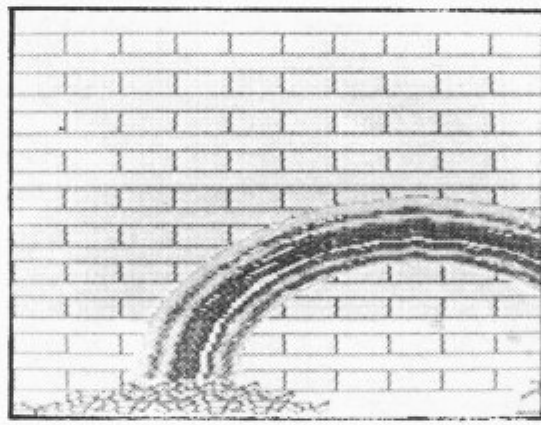
Shooting the rapids and underground adventure complete the task. All the games give variety to tables work and are just the sort of contribution to learning that home-computers should make.

Sulis software has three impressive looking boxes: **Just-a-Mot** (French vocabulary), **Besieged** (spelling) and **Wordpower** (vocabulary and spelling) which takes us back to square one. If we take the French vocabulary package as an example — its philosophy seems to be that if you test long enough and hard enough learning takes place. Choices are available — you may be tested on people, travel, food and drink, shopping and essentials and the test may be games or a writing option.

The words you are tested on you cannot see beforehand; all of the action takes place on the text screen so no accents can be written although the *number* of accents in a word is required to be known at higher levels.

Besieged follows a similar pattern. Words are asked for (a definition is given)


The correct tables solution . . .


. . . brings you the pot of gold

but you have no chance to learn the words beforehand. Three mistakes in any word and you have to start the test over again. The package does not stand up to comparison with say Eurosoft's Talking Speller (*Dragon User,* February) and really makes no worthwhile contribution to educational programming.

Vocabulary

Wordpower claims to increase your vocabulary and contains over 1,200 words, including opposites, synonyms, nouns/adjectives, collectives and similes. The basic format is the same as Just-a-Mot with options for games or writing but without a chance to learn the information before a test nor to create your own test data.

Cablesoft's **Geography** is another in the series "Quizzes you have known and loved". What is the capital of Burundi? A choice of five towns is given and if you are not Burundian and therefore get it wrong the program will tell you. It will also ask you about currency too if you choose. I can't see why you should want to know about Macao's capital for example, or the money they use and what the purpose of a hi-resolution map of the world and low-res ones of each of five continents is. However, the program does have one useful attribute — it will do a data search for you to find the capitals and currency of any country you name. Type in France, for example, and quick as a flash it will produce Paris. It can even cope with spelling errors. Luxbug came out eventually with: the capital of Luxembourg is Luxembourg. Is this the country you mean? The thought strikes me that if we have the potential to come up with the capital Haiti in about two seconds flat why are we clogging up our minds with such garbage when machines will do it for us. Surely we should leave them free to be creative and do those things machines can't.

A more serious attempt to help children learn is the series of programs by Scisoft Educational Software. **Chemistry** comes with a book of 53 pages of concise revision notes, two sets of problems with randomised data, multiple choice questions with answers and a program giving advice on how to study and revise at home. The first program begins:

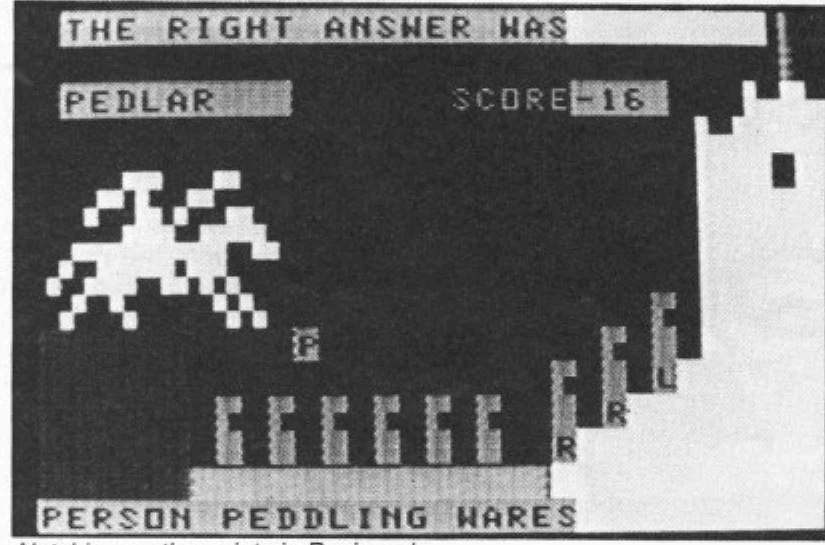
SO YOU THINK THIS WILL PASS YOUR CHEMISTRY EXAM FOR YOU. SORRY IT WILL NOT. WHAT IT WILL DO IS SHOW YOU WHAT YOU CAN DO TO HELP YOURSELF.

The important message is, of course, that there is no substitute for hard work.

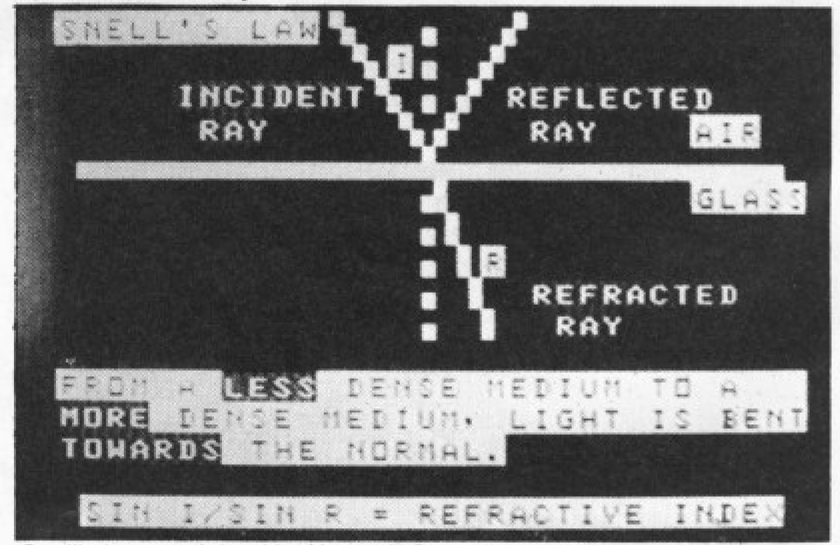
Each of the sections loads a hi-res text machine code file to mix text and graphics and produce those terrifying chemical formulae like KMn04 and Fe203 which would look nonsense on the text screen.

Physics is much the same. A useful revision book is provided and sections on mechanics, electricity, heat/pressure, light and sound are programmed. Twenty questions are used in each section and marks awarded for your efforts. When you have achieved 100 the authors consider your knowledge to be adequate in this area. Diagrams help where appropriate and there is a recap option at each stage.

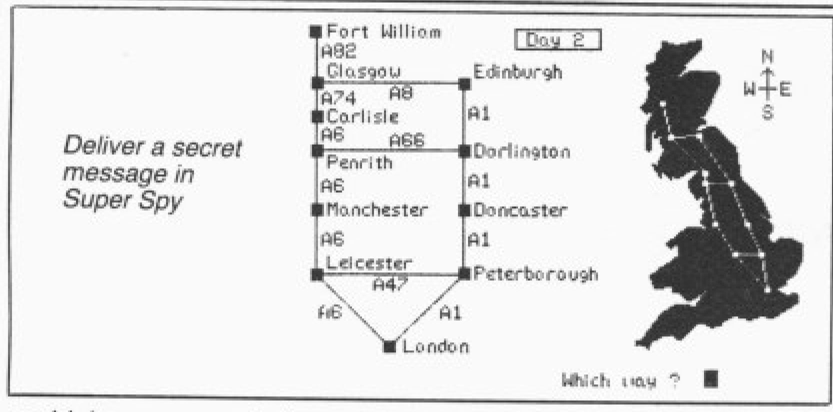
Physics involves a great deal of mathematical manipulations and any revision program must involve a high input of such problems. Two programs on the tape provide this and the unknown quantity is randomised providing practice in manipulating equations. I believe the authors



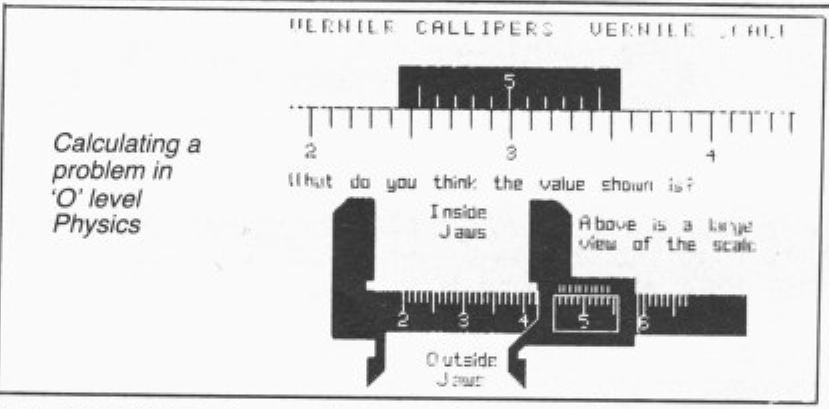
Notching up the points in Besieged



Snell's Law explained in Abacus' 'O' level Physics



Deliver a secret message in Super Spy



Calculating a problem in 'O' level Physics

could have gone further still in that the actual quantities could be randomised. For example, the problem on Snell's Law asks for a refractive index D/A. If you are wrong, you're told the answer but unfortunately not how to find it. The second attempt at the question is identical to the first — a wasted opportunity. If the angles of refraction were randomised then a different question could result at each turn. This is especially easy in this particular question (Basic supports Sin 0) but I'm sure can be worked for them all.

Useful revision

On the whole, these science packages would be useful as part of a revision program for major examinations. The seriousness of the publishers is underlined in their caveat: "This package is intended to complement the work by the pupil in school. It is not intended to be a complete 'O' level course. Provided that it is used in conjunction with the normal course work it should provide added stimulus and assistance."

Three other Scisoft programs are not of quite the same quality. **Jungle Maths** and **Astromaths** set out with the aim of making practice at the 4 rules of number more palatable. Taken at this level I suppose the tapes succeed. The child has to find his way through the jungle by answering maths drill type questions. A low resolution map charts his progress.

The exciting thing is what happens to you when you fail. Falling down a pit, being attacked by vampire bats, falling into a river (halving allowed response time) are mild by comparison to serious disasters. These are beautifully drawn on the hi-res screen in four colours along with a lion eating you — he spits out your head and you get squeezed by a snake — all quite horrific.

Fractions and percentages are the key to Astromaths. "Galactic Pulsars" is the game you play and you are allowed a shot at Kroton every two successful answers. There are options on difficulty and the test requires 80 per cent accuracy for you to save your ship. I don't know what the poor Krotons have done to deserve such treatment: perhaps they failed to achieve 80 per cent accuracy on their planet's equivalent test. For children of nine years and older this program might afford some amusing practice but I do find that the way data has been handled is frustrating. I got the question ½=0.5 five times in a row on the easiest level of difficulty and 10/3=0.333 was rejected as not enough places of decimals had been written on the hardest level.

Star Reader starts off beautifully. A superb picture of a mountain scene begins the story, telling of a day in the mountains. Unfortunately the rest of the program doesn't quite match up to the beginning. The tale is text screen only and therefore in capitals and quite confusing to the young children who it's supposed to help.

"O" level Physics — Measuring Instruments 1 **Measuring Instruments 2** **"O" level Geography** **First letters and words** **ABC** **Tell the time** £6.50 each **Music Tutor** £9.95	Abacus Software 21 Union Street Ramsbottom Nr Bury Lancs
Geography £6.95	Cablesoft PSL Marketing 52 Limbury Road Luton Beds LU3 2PL
Face Maker **Shape-Up** **Tables Adventure** £10.95 each	
Super Spy **Computer Studies** **Maths "O" level part 1** **Maths "O" level part 2** **Maths 2 (6-7) (beginners)** **Basic tutorial (advanced)**	Cheshire Cat Educational Series Ampalsoft 31 Woodbridge Road Darby Green Blackwater Camberley Surrey
Just-a-Mot **Besieged** **Wordpower** £9.95 each	Sulis Software 4 Church Street Abbey Green Bath BA1 1NL
Chemistry **Physics** £7.95 each **Jungle Maths** **Astromaths** **Star Reader** £5.00 each	Scisoft Educational 5 Minister Gardens Newthorpe Eastwood Notts

A lot of thought has obviously gone into the close procedure sessions. The four programs which make up Star Reader are those often used in junior school projects. So except for the problem of lower case the program would be useful and is the sort of program, on say the BBC machine, much in demand in school.

Abacus software produces a range of educational material for a wide variety of ages. Its **"O" level Physics measuring instruments** (one on length and one on volume) give some graphic demonstrations of the use of rules, verniers and micrometers, pipettes and burettes. Questions as to estimating these quantities also form part of the program.

"O"level Geography weather map symbols is rather dry. It consists of screen after screen of symbols for 7/8 cloud cover and wind directions. **First letter and words** is rather poor too. Letters are drawn on the screen either on command or in order. Quite what the value of interest in this is I've yet to discover. Its other infant pack, however, is probably the best of the bunch. **ABC** requires the user to load several items from quayside to tanker by hitting the first letter of their names. The illustrations are well drawn and clear and the pace and style suitable for the children it is designed to reach.

Music Tutor is fine. It is also one of the only four packages to come from Abacus with reasonable documentation. The program allows music to be written, displayed in note form, played and saved on tape as data. There are also four full files of demonstration tunes. It has one annoying feature to those of us susceptible to that speed-up poke. My Dragon kept leaping out of the program whenever I opted for the "Musicprint" option. If yours does the same then rewrite line 4320 to read:
FORN = 1 TOLEN (H$) and this will cure it.

Language options

Tell the time is a quiz on getting the time right as shown on a clock face. The time you have to get is represented in the computer's memory as strings so be very particular how you answer. The program has French and German options and also contains a mistake. A time of 9.20 is drawn on the screen and the answer required is 8.50. If you intend to use it with children then insert D1$ = "20 PAST 9" after the data search and re-save to be sure. By the time we came to struggle with Il est dix moins le quart and so on the mistake had been cured so obviously it had been discovered by the publishers. Odd that they didn't go back and correct the English version.

To sum up, although the educational software now available for the Dragon still consists of quizzes being produced under an educational flag of convenience, the tide is turning and quality programs contributing to children's thinking and learning are out and about.■

Scramble, scramble!

*Don't drop the eggs in **Steve Gathercote's** Cave Bird game*

THE IDEA of the game is to fly the "flapping" bird to the other side of the cave and pick up an egg (the egg will not disappear as you pick it up but will reappear at the nest). Use the right joystick for left and right movement and the fire button for upward movement.

The game may sound easy, but the eggs are slowly sinking into the mud and you must not bump into stalactites or your egg will be smashed (if you have one) and you also stand the chance of being knocked out. The program makes use of the Dragon's GET and PUT commands and also the PPOINT function.

Draw strings have been used to provide text on the high resolution screen, in "computer-style" writing.

Variables

DX and DY	Position of birds x and y
MY	Mud level
BU	Number of bumps
W$	Print string
JO	Joystick variable
XX and YY	Position for letters strings

Array Notes

DL	Bird left wing up
DR	Bird right wing up
DS	Bird in mud
BL	Blank
LW	Bird left wing down
RW	Bird right wing down
NW	Bird sitting

Program Notes

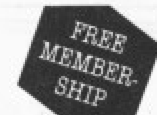
10-90	Initialise
100-190	Draw display screen and introduction screen
200-430	Draw screen and sets start position
440-700	Main loop
710-720	Positions bird at start position
750-820	Routine for bird falling (left)
830-900	Routine for bird falling (right)
910-1080	Routine for falling into mud
1090-1160	Routine to say "Goodbye"
1170-1260	Routine for bird up or down (left)
1270-1400	Routine for bird knocked out
1410-1500	Check for eggs all sunk
1510-1610	Routine for bird up or down (right)
1620-1690	Routine for bird up and left
1700-1770	Routine for bird up and right
1780-1800	Routine to draw letters
1810-1820	Routine to draw score numbers
1830-1970	Initial screen
1980-2290	Instructions
2300-2460	Display wait sign
2470-2550	Read and set up graphics to poke on to screen
2560-2840	Data for graphics
2850-2920	Gets graphics into arrays
2930-2950	Reads data for draw strings
2960-3130	Data for draw strings

```
10 REM INITLISE
20 CLEAR 300
30 DIM DL(8):DIM DR(8):DIMDS(5):DI
M LW(8):DIM RW(9):DIM NW(8):DIM NR
(9)
40 DIM NN$(9):DIM LL$(26):DIM  BL(
8)
50 DIMBG(8)
60 DX=222:DY=143:JO=JOYSTK(0):J1=J
OYSTK(1)
70 MY=174:EG=0:H=170:EX=248:EY=194
:BU=0
80 GOSUB 1830:GOSUB 2310:GOSUB 247
0
90 PRINT@165,STRING$(20," ");:PRIN
T@260,STRING$(24," ");:PRINT@265,"
nearly ready";:SOUND 100,4:GOSUB 2
940
100 Z=200:REM DISPLAY SCREEN
110 PMODE 3,1:SCREEN 1,0:PCLS3
120 XX=60:YY=15:W$="CAVE BIRD":GOS
UB 1780:SOUND 80,1
130 XX=110:YY=65:W$="BY":GOSUB 178
0:SOUND 120,2
140 XX=36:YY=100:W$="STEVE GATHERC
OLE":GOSUB 1780:SOUND 200,3
150 Z=Z-10:PUT(Z,150)-(Z+29,161),D
L,PSET:SOUND 250,1
160 PUT(Z,150)-(Z+29,161),LW,PSET
170 IF Z<=5 THEN 200:PUT(Z,150)-(Z
+29,161),LW,PSET
180 PUT(Z,150)-(Z+29,161),BL,PSET
190 GOTO 150
200 PCLS3:REM DRAW SCREEN LAYOUT
210 COLOR 4:DRAW"BM32,0;D22;F4;R4;
E6;U8;H4;U8"
220 COLOR 4:DRAW"BM92,0;F14;D28;G8
;D16;F4;D26;F4;R8;U10;H4;U14;E4;U2
4;E2;U24;E10;U8"
230 COLOR 4:DRAW"BM164,0;F8;D6;F4;
D16;F6;E4;U18;E4;U6;H8"
240 COLOR 4:DRAW"BM232,0;D10;G4;D1
0;F8;E6;U10;E12"
250 COLOR 4:DRAW"BM0,184;R38;U10;E
6;U24;H4;U20;H2;U14;E4;U8;H8;U10;E
4;F14;D24;G6;F8;D12;G6;F8;D22;F8;D
10;R20;E2;R12;F2;R8;U22;H6;U20;E4;
R8;D10;G4;D14;F4;D14;F6;D4;R28;E2;
R12;F2;R8;U28;H8;U30;E6;U32;H6;U4;
E6;F6;D46;F4;D62;R40;U24;R7;D30"
260 PAINT(46,188),4,4
270 PAINT(188,190),4,4
280 PAINT(113,140),4,4
290 PAINT(115,186),4,4
300 PAINT(36,4),4,4
310 PAINT(104,4),4,4
320 PAINT(178,4),4,4
330 PAINT(240,4),4,4
340 FOR S=4 TO 28 STEP 8
350 CIRCLE(S,170),4,2:PSET(S,170,2
):NEXT S
360 COLOR 2:LINE(222,155)-(254,161
),PSET,BF
370 COLOR 1:DRAW"BM0,184;R38;U10;L
38":PAINT(3,180),1,1
380 XX=0:YY=0:W$="EGGS":GOSUB 1780
390 XX=54:YY=0:SC=0:GOSUB 1810
400 TIMER=0
410 DX=222:DY=142:GET(DX,DY)-(DX+2
9,DY+11),BG,G:EG=0
420 PUT(DX,DY)-(DX+29,DY+11),NW,PS
ET
430 IF (PEEK(65280)AND 1)>0 THEN G
OTO 420
440 REM MAIN LOOP
450 JO=JOYSTK(0):TI=TIMER:IF MY<=1
66 AND BU<3  THEN GOSUB 1410
460 IF TI>2000 THEN COLOR 1:LINE(0
,MY)-(38,MY),PSET:TIMER=0:MY=MY-1
470 IF BU>=3 THEN GOTO 1270
480 IF PPOINT(DX+10,DY+13)=2 AND D
X>200 AND EG=1 THEN PLAY"T10V30GGG
GGGG":EY=EY-8:CIRCLE(EX,EY),4,2:SC
=SC+1:EG=0:GOSUB 1810
490 IF EY<=170 THEN EX=236:EY=194
500 IF JO>31 THEN 610
510 IF JO<5 AND (PEEK(65280)AND 1)
=0 THEN PUT(DX,DY)-(DX+29,DY+11),B
G,PSET:DX=DX-10:DY=DY-4:GOSUB 1630
520 IF PPOINT(DX-1,DY+6)=4 THEN BU
=BU+1:GOTO 760
530 IF (PEEK(65280)AND 1)=0 THEN P
UT(DX,DY)-(DX+29,DY+11),BG,PSET:DY
=DY-8:GOSUB 1510
540 IF PPOINT(DX,DY-2)=4 THEN BU=B
U+1:GOTO 760
550 IF (PEEK(65280)AND 1)>0 THEN P
UT(DX,DY)-(DX+29,DY+11),BG,PSET:DY
=DY+8:GOSUB 1510
560 IF PPOINT(DX+13,DY+12)=4 THENB
U=BU+1: GOTO 760
570 IF PPOINT(DX+10,DY+14)=2 AND D
X<40 AND EG=0 THEN PLAY"T20V30GGGF
FDDEEE":EG=1
580 IF PPOINT(DX+13,DY+13)=1 THEN
GOSUB 910
590 GOTO450
600 REM FLY RIGHT
610 IF (PEEK(65280) AND 1)=0 AND J
O>58  THEN PUT(DX,DY)-(DX+29,DY+11
),BG,PSET:GOSUB 1710
620 IF PPOINT(DX+30,DY+6)=4 THEN G
OTO 830
630 IF(PEEK(65280)AND 1)=0 THEN PU
T(DX,DY)-(DX+29,DY+11),BG,PSET:DY=
DY-8:GOSUB1180
```

```
640 IF PPOINT(DX,DY-1)=4 THEN BU=B
U+1: GOTO 830
650 IF(PEEK(65280)AND 1)>0 THEN PU
T(DX,DY)-(DX+29,DY+11),BG,PSET:DY=
DY+8:GOSUB 1180
660 IF PPOINT(DX+13,DY+12)=4 THEN
BU=BU+1: GOTO 830
670 IF PPOINT(DX+10,DY+14)=2 AND D
X<40 AND EG=0 THEN PLAY"AAAAA":EG=
1
680 IF PPOINT(DX+10,DY+14)=1 THEN
GOSUB 910
690 GOTO450
700 REM END OF LOOP
710 DX=222:DY=144
720 PUT(DX,DY)-(DX+29,DY+11),NW,PS
ET
730 EG=0      740 GOTO 450
750 REM BIRD FALLS(LEFT)
760 SOUND 200,1:SOUND 100,1:PUT(DX
,DY)-(DX+29,DY+11),BG,PSET
770 DY=DY+8
780 IF DY>=170 THEN DY=170 :GOTO 4
00
790 GET(DX,DY+11)-(DX+29,DY+22),BG
,G
800 PUT(DX,DY+11)-(DX+29,DY+22),DL
,PSET
810 PUT(DX,DY+11)-(DX+29,DY+22),BG
,PSET
820 GOTO 770
830 REM BIRD FALL RIGHT
840 SOUND 200,1:SOUND 100,1:PUT(DX
,DY)-(DX+29,DY+11),BG,PSET
850 DY=DY+8
860 IF DY>=170 THEN DY=170:GOTO 40
0
870 GET(DX,DY+11)-(DX+29,DY+22),BG
,G
880 PUT(DX,DY+11)-(DX+29,DY+22),DR
,PSET
890 PUT(DX,DY+11)-(DX+29,DY+22),BG
,PSET
900 GOTO 850    910 REM HIT MUD
920 PUT(DX,DY)-(DX+29,DY+11),BL,PS
ET:PUT(DX+3,DY+1)-(DX+22,DY+10),DS
,PSET
930 FOR I=0 TO 4  960 SCREEN 1,0
940 SCREEN 1,1    970 SOUND 250,1
950 SOUND 250,1   980 NEXT I
990 PLAY"T255L255CDEFGAB"
1000 XX=10:YY=40:W$="THE MUD GOT Y
OU":GOSUB 1780
1010 PLAY"T255L255CDEFGAB"
1020 XX=10:YY=80:W$="PRESS S TO GO
 AGAIN":GOSUB 1780
1030 PLAY"T255L255CDEFGAB"
1040 XX=10:YY=120:W$="PRESS N TO S
TOP":GOSUB 1780
1050 PLAY"AAACCCGGGAAA"
1060 A$=INKEY$:IF A$="S" THEN MY=1
74:GOTO  200
1070 IF A$="N" THEN 1090
1080 GOTO 1060   1090 REM GOODBYE
1100 PCLS3:XX=58:YY=5:W$="CAVE BIR
D":GOSUB 1780
1110 XX=100:YY=40:W$="BY":GOSUB 17
80
1120 XX=20:YY=80:W$="STEVE GATHERC
OLE":GOSUB 1780
1130 XX=30:YY=140:W$="GOODBYE":DRA
W"S8":GOSUB 1780
1140 FOR T=1 TO 1000:NEXT T
1150 CLS     1160 STOP
1170 REM BIRD UP OR DOWN
1180 IF DX>220 THEN DX=220
1190 IF DY>170 THEN DY=170
1200 IF DY<3 THEN DY=3
1210 GET(DX,DY)-(DX+29,DY+11),BG,G
1220 IF PPOINT(DX+13,DY-1)=4 THEN
BU=BU+1:GOTO 830
1230 PUT(DX,DY)-(DX+29,DY+11),DR,P
SET
1240 PUT(DX,DY)-(DX+29,DY+11),BG,P
SET
1250 PUT(DX,DY)-(DX+29,DY+11),RW,P
SET
1260 RETURN
1270 REM BIRD KNOCKED OUT
1280 PCLS3:XX=30:YY=15:W$="TOO MAN
Y BUMPS ":GOSUB1780
1290 PLAY"V10T255L255CDEFGAB"
1300 XX=50:YY=40:W$="BUT YOU GOT "
:GOSUB 1780
1310 XX=100:YY=60:GOSUB 1810
1320 XX=85:YY=80:W$="EGGS":GOSUB 1
780
1330 PLAY"V20T255L255CDEFGB"
1340 XX=10:YY=120:W$="PRESS S TO G
O AGAIN":GOSUB 1780
1350 PLAY"V26T255L255CDEFGAB"
1360 XX=10:YY=160:W$="PRESS N TO S
TOP":GOSUB 1780
1370 PLAY"V31T255L255CDEFGAB"
1380 A$=INKEY$:IF A$="S"THENMY=174
:BU=0:PCLS3:GOTO 200
1390 IF A$="N" THEN GOTO 1090
1400 GOTO 1380
1410 REM EGGS GONE
1420 PLAY"AAAAGGGG"
1430 FOR M=MY TO 174
1440 COLOR 3:LINE(0,M)-(38,M),PSET
1450 SOUND 230,1
1460 NEXT M
1470 FOR S=4 TO 28 STEP 8
1480 CIRCLE(S,170),4,2:PSET(S,170,
2):NEXT S
1490 MY=174
1500 RETURN
1510 REM BIRD UP OR DOWN
1520 IF DX<3 THEN DX=3
1530 IF DX>224 THEN DX=224
1540 IF DY<3 THEN DY=3
1550 IF DY>170 THEN DY=170
1560 GET(DX,DY)-(DX+29,DY+11),BG,G
1570 IF PPOINT(DX+13,DY-1)=4 THEN
GOTO 760
1580 PUT(DX,DY)-(DX+29,DY+11),DL,P
SET
1590 PUT(DX,DY)-(DX+29,DY+11),BG,P
SET
1600 PUT(DX,DY)-(DX+29,DY+11),LW,P
SET
1610 RETURN
1620 REM BIRD UP AND LEFT
1630 IF DX<3 THEN DX=3
1640 IF DY<3 THEN DY=3
1650 GET(DX,DY)-(DX+29,DY+11),BG,G
1660 IF PPOINT(DX+13,DY-1)=4 THEN
BU=BU+1:GOTO 760
1670 PUT(DX,DY)-(DX+29,DY+11),DL,P
SET
1680 PUT(DX,DY)-(DX+29,DY+11),LW,P
SET
1690 RETURN
1700 REM BIRD UP AND RIGHT
1710 IF DX>=215 THEN DX=215:IF PPO
INT(DX+13,DY-1)=4 THEN GOTO 760
1720 DX=DX+10:DY=DY-4
1730 GET(DX,DY)-(DX+29,DY+11),BG,G
1740 PUT(DX,DY)-(DX+29,DY+11),DR,P
SET
1750 PUT(DX,DY)-(DX+29,DY+11),BG,P
SET
1760 PUT(DX,DY)-(DX+29,DY+11),RW,P
SET
1770 RETURN
1780 COLOR 2:DRAW"BM"+STR$(XX)+","
+STR$(YY):FOR J=1  TO LEN(W$):ZZ=A
SC(MID$(W$,J,1))-64:IF ZZ<0  THEN
ZZ=0
1790 DRAW LL$(ZZ):NEXT J
1800 RETURN
1810 PUT(50,0)-(79,11),BL,PSET:TE=
INT(SC/10):UN=SC-10*TE:COLOR 2:DRA
W"BM"+STR$(XX)+","+STR$(YY)+";"+NN
$(TE)+NN$(UN)
1820 RETURN
1830 CLS3:PRINT@1,STRING$(30,CHR$(
134+48));
1840 PRINT@481,STRING$(30,CHR$(134
+48));
1850 FOR T=32 TO 448STEP 32
1860 PRINT@T,CHR$(134+48);
1870 NEXT T
1880 FOR S=63 TO 479 STEP 32
1890 PRINT@S,CHR$(134+48);
1900 NEXT S
1910 FOR S=1 TO 6
1920 PRINT@106,"CAVE  BIRD";
1930 PRINT@173,"BY";
1940 PRINT@230,"STEVE  GATHERCOLE";
1950 FOR M=0 TO 5:PLAY"O1":FOR N=1
 TO 4:PLAY"T255CDEFGABO+":NEXT N:N
EXT M
1960 PRINT@389,"INSTRUCTIONS (Y/N)
?";
1970 INPUT A$:IF A$="Y" THEN 1990
ELSE RETURN
1980 REM INSTRUCTIONS
1990 CLS:PRINT@42,"CAVE  BIRD"
2000 PRINT
2010 PRINT"THE OBJECT OF THE GAME
IS TO FLY";
2020 PRINT"YOUR BIRD TO THE OTHER
END OF"
```

Continued on page 21





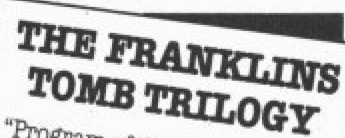
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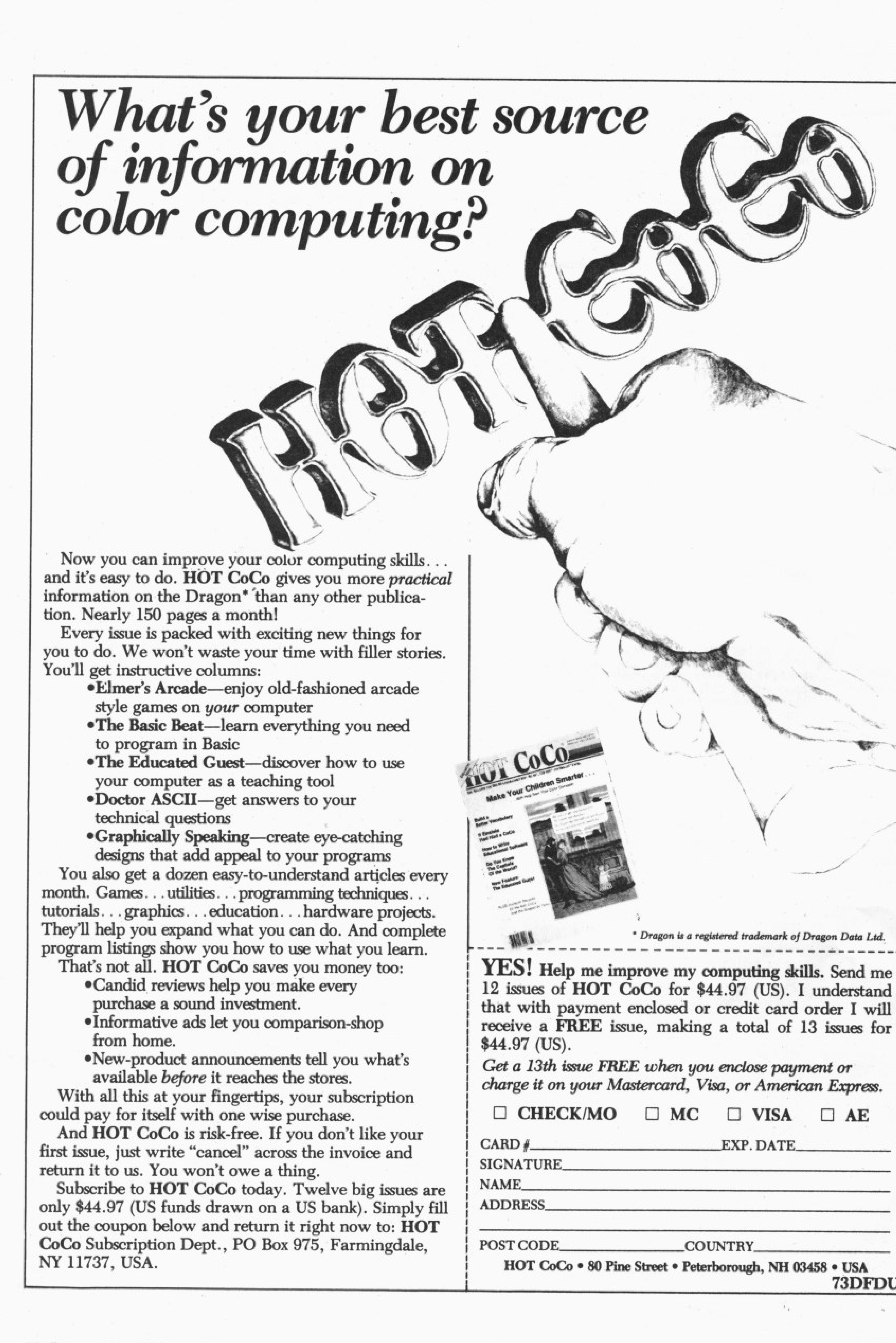
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```
2030 PRINT"THE CAVE AS YOUR MATE H
AS LAYED"
2040 PRINT"THE EGGS IN THE WRONG P
LACE"
2050 PRINT"YOU MUST COLLECT THE EG
GS AND"
2060 PRINT"BRING THEM OVER TO THE
NEST"
2070 PRINT@423,"press any key"
2080 D$=INKEY$:IF D$="" THEN 2080
ELSE SOUND 100,2:CLS
2090 PRINT"THE TROUBLE IS THEY ARE
 SINKING"
2100 PRINT"INTO THE HORRIBLE GREEN
 MUD."
2110 PRINT"YOU CAN ONLY MOVE FORWA
RD WHEN"
2120 PRINT"YOU ARE FLYING"
2130 PRINT:PRINT"USE THE RIGHT JOY
STICK FOR"
2140 PRINT"FORWARD MOVMENT AND FIR
E BUTTON"
2150 PRINT"TO FLY UP"
2160 PRINT@423,"press any key"
2170 A$=INKEY$:IF A$="" THEN 2170:
ELSE SOUND 150,2
2180 CLS:PRINT"BUT BEWARE YOU MUST
 NOT BUMP"
2190 PRINT"INTO THE STALGTITES TO
OFTEN"
2200 PRINT"AS YOU WILL BE KNOCKED
OUT"
2210 PRINT"AND YOUR EGG GETS SMASH
ED"
2220 PRINT"THE EGGS WILL NOT DISAP
EAR AS "
2230 PRINT"YOU PICK THEM UP BUT WI
LL"
2240 PRINT"REAPEAR AT THE NEST."
2250 PRINT"IF YOUR EGG HAS NOT BEE
N SMASHED"
2260 PRINT"IF YOU ARE STILL ALIVE
AND"
2270 PRINT"THE EGGS HAVE SUNK THEY
"
2280 PRINT"WILL BE REPLACED......"
2290 PRINT@423,"press any key":A$=
INKEY$:IF A$="" THEN 2290
2300 SOUND 200,2:RETURN
2310 CLS0:REM DISPLAY WAIT SIGN
2320 A$=CHR$(158)+STRING$(30,CHR$(
156))+CHR$(157)
2330 B$=CHR$(154)+CHR$(174)+STRING
$(28,CHR$(172))+CHR$(173)+CHR$(149
)
2340 C$=CHR$(154)+CHR$(171)+STRING
$(28,CHR$(163))+CHR$(167)+CHR$(149
)
2350 D$=CHR$(155)+STRING$(30,CHR$(
147))+CHR$(151)
2360 F$=CHR$(154)+CHR$(170)+STRING
$(28," ")+CHR$(165)+CHR$(149)
2370 PRINTA$;       2400 PRINTF$;
2380 PRINTB$;       2410 NEXT K
2390 FOR K=1 TO 11  2420 PRINTC$;
2430 PRINTD$;
2440 PRINT@165,"HANG ON A MINUTE T
HE";
2450 PRINT@260,"GRAFICS ARE BEING
SET UP";
2460 RETURN
2470 REM SET UP GRAFICS
2480 PMODE 3,1:PCLS3
2490 GOTO 2550
2500 FOR P=1 TO 12:READ Q
2510 POKE A,Q  2520 A=A+32
2530 NEXT P
2540 A=A-384:RETURN
2550 FOR A=1536 TO 1564 :GOSUB 250
0:NEXT A
2560 DATA 170,170,170,170,170,165,
165,209,165,170,170,170
2570 DATA 170,170,170,170,165,165,
149,85,157,154,149,165
2580 DATA 169,165,149,85,84,84,84,
80,81,245,85,84
2590 DATA 106,170,170,170,170,170,
170,166,90,106,170,170
2600 DATA165,169,169,169,170,170,1
70,106,149,165,169,170
2610 DATA 170,106,90,86,85,85,85,1
49,149,127,85,85
2620 DATA 170,170,170,170,106,105,
89,85,217,90,90,106
2630 DATA 170,170,170,170,170,106,
106,222,106,170,170,170
2640 DATA 170,170,169,169,170,149,
```

```
87,93,93,93,170,170
2650 DATA 234,106,214,86,106,90,85
,85,85,85,170,170
2660 DATA 170,170,170,170,170,170,
170,170,106,90,170,170
2670 DATA 170,170,170,170,170,170,
170,170,170,170,170,170
2680 DATA 170,170,170,170,170,170,
170,170,170,170,170,170
2690 DATA 170,170,170,165,165,221,
165,170,170,170,170,170
2700 DATA 170,170,170,165,149,117,
149,159,165,170,170,170
2710 DATA 170,170,170,106,86,93,87
,87,213,149,165,169
2720 DATA 170,170,170,170,170,166,
90,106,170,170,170,106
2730 DATA 170,170,170,170,170,154,
165,169,170,170,170,169
2740 DATA 170,170,170,169,149,117,
213,213,87,86,90,106
2750 DATA 170,170,170,90,86,93,86,
246,90,170,170,170
2760 DATA 170,170,170,90,90,119,90
,170,170,170,170,170
2770 DATA 170,170,170,165,165,221,
165,170,170,170,170,170
2780 DATA 170,170,170,165,149,93,1
57,151,165,165,170,170
2790 DATA 170,170,170,106,86,85,85
,87,253,86,170,170
2800 DATA 170,170,170,170,170,166,
90,106,170,170,170,170
2810 DATA 170,170,170,170,170,154,
165,169,170,170,170,170
2820 DATA 170,170,170,169,149,85,8
5,213,127,149,170,170
2830 DATA 170,170,170,90,86,117,11
8,214,90,90,170,170
2840 DATA 170,170,170,90,90,119,90
,170,170,170,170,170
2850 GET(0,0)-(29,11),DL,G
2860 GET(32,0)-(61,11),DR,G
2870 GET(64,0)-(83,9),DS,G
2880 GET(0,12)-(29,23),BL,G
2890 GET(104,0)-(133,11),LW,G
2900 GET(138,0)-(167,11),RW,G
2910 GET(168,0)-(197,11),NW,G
2920 GET(200,0)-(231,11),NR,G
2930 GOTO 90
2940 FOR J=0 TO 9:READ NN$(J):NEXT
 J
2950 FOR J=0 TO 26:READ LL$(J):NEX
T J
2960 RETURN
2970 DATA D7R2NU1R4U7L2ND1L2BR8,R2
D7L2R4BU7BR4,R6D3L6D4R2NU3R4BU7BR4
,R6D7L6R4U4NL2BU3BR6
2980 DATA D6R6L2D1U2BU5BR6,NR6D3R6
D4L2NU3L4U2BU6BR10,D7R2NU2R4U4L4BU
3BR8
2990 DATA R4D7R2U7BR4,D7R6U4NL4U3N
L4BR4,D3R4D4L4NU1R6U7NL4BR4
3000
3010 DATA BR12
3020 DATA D7R2U3R6ND3U4D1L2U1NL6BR
6,D7R2U4R6D4L8U7R6ND3BR6,D7R2NU4R6
U1BU5U1NL8BR4,D7R2NU4R6U6D1L2U2NL6
BR6,D7R2NU4R6U1BU3BL2L6U3R8ND1BR4,
D7R2U4NR4BU3R6ND1BR4,D7R2NU4R6U4NL
2BU2U1NL8BR4
3030 DATA D7R2U4R6ND4U3BR4,D7R2U4B
U3BR4,BD5D2R2NU2R4U7BR4,D7R2U4R4NU
3R2ND4BU3BR4,D7R2NU4R6U1BU6BR4
3040 DATA D7R2U3BU4R4ND7R6ND7BR4,D
7R2U4BU3R6D1NL2D6BU7BR4,D7R2NU4R6U
7D1L2U1NL6BR6,D7R2U4R6U3NL8BR4,D7R
2NU4R8U1L2U6NL8BR6,D7R2U4R6ND4L2U3
NL6BR6,D3R8BU2NL2U1NL8BD3D4L6NU2L2
U2BU5BR12,R2D7R2U4BU3R4BR4
3050 DATA D7R2NU4R6U7D1L2U1BR6,D5R
2NU3ND1R2ND2R2ND1R2U5BR4,D7R2NU4R4
NU7R6U7BR4,D2BD2D3R2U4NU3R4NU3ND4B
R2BD1ND3BU2U2BR4,D3R2D4R2U2BU2R4U3
BR4,ND1R2ND1R6D1BD1BL1L1D1BL1L1D1B
L1L1D1BL2D2R2NU3R4NU1R2U1BU6BR4
3060 DATA D11R2U5R8D1NL8D4U11D2L2U
2L6D1R6U1BR6
3070 DATA R10D1L10R4D10R2U7BR8BU4
3080 DATA D11R2NU7R8U1NL6U10D2L2U2
L6D1R6BU1BR6
3090 DATA D11R2U6BU5R4D1NL4ND10U1N
R6D1R4ND1R2D10BU11BR4
3100 DATA D11R2U6NR8D1R8D5U11BR4
3110 DATA D11R2NU8NR8U1R8U10BR4
3120 DATA D11R2U7BU3R6ND1R2L8U1R8D
11BR4BU11
3130 END
```


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Machine code special

Getting to grips with machine code

***Keith and Steven Brain** simplify the jargon as they take a look at the S-22 Toolkit from Ashby Computers and Microtanic's Ace Trace . . .*

AS HOME computer users become more experienced they often feel that it is time they left the relatively safe haven afforded by Basic and begin to delve deeper into the box to get to grips with machine code programming.

A major problem for the novice who is looking for a machine code programming aid is that everything is steeped in jargon. There is not enough room here to explain all of this but to start with we will make a few simple definitions, which should make our comments later rather clearer.

Op-codes

A Machine Code Program consists of a series of memory locations containing numbers which represent specific instructions ot the CPU. These numbers are known as *op-codes.* Although we normally use decimal (base 10) numbers the computer uses the more efficient *hexadecimal* (base 16) notation.

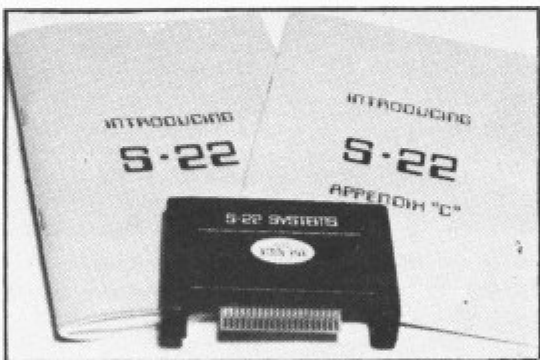
In this the letters A to F represent the digits 10 to 15, so that any number up to 255 can be indicated by two digits, which can be stored in a single byte. Unfortunately most people find it difficult to think in hexadecimal (perhaps because they run out of fingers).

A Machine Code Monitor allows you to directly examine and modify the contents of specific memory locations. A machine code program can be created in this way, by entering the appropriate op-codes, but unless you have the memory of an elephant it is very tedious for anything other than very short programs.

As most of us are happier with words than numbers, each op-code can also be represented by a *mnemonic,* which gives a good indication of the action. For example: INCA (=4C) increments the value in register A by one

A Disassembler reads the contents of memory locations and translates the op-codes into mnemonics.

A Machine Code Editor allows you to construct a text file using mnemonics (rather like a Basic program) which you can easlily modify during program development. This text file is known as the *source code* and it cannot be executed directly.



An Assembler translates the source code into object code, which is the final machine code routine. This is very compact, but difficult to edit.

A Trace program allows you to run your program in slow motion, with disassembly and/or display of the contents of each CPU register at each step.

Although a number of machine code programming tools have been available for the Dragon for some time, two new products have recently entered the arena. The S-22 Microcomputer Systems Toolkit consists of a small cartridge and extensive manual in what can only be described as an emnormous cardboard box, whilst Microtanic Software's Dragon Ace Trace comes on cassette, together with a slimmer manual, in a "video box".

The **S-22 Toolkit** is extremely well-sealed into a small cartridge. Unfortunately, it is rather difficult to slide into the Dragon cartridge port, as to line up the PCB with the internal edge connector you must leave about 3mm of fresh air under the lower edge of the box! (Extensive fumbling and cursing soon gave way to standing the Dragon on its side for insertion.)

The manual is in two parts, extending to over one hundred pages, but we found that it did not live up to its promise of being "easy to understand". Undoubtedly the coverage is comprehensive but the style is a strange mixture of Listen with Mother, Advanced Computer Science, Successful Salesmanship and a political manifesto, in which the thread somehow seems to get lost on the way.

Virtuous

For example, on page 3 the author states "I will now take a pause as you read the programming manual for the 6809, and a book on machine code programming. If you return still in one piece and sane, I will continue to introduce S-22 to your machine". However, regrettably, he makes no suggestions on what to read, but instead continues to extol the virtues of the product at great length ("It's a workhorse and will probably never be to far from your

```
   E<
>M 701D ? 7000
7000 8E L LDX      £0400
7003 A6 L LDA      00,X
7005 88 L EORA     £40
7007 A7 L STA      X+
7009 8C L CMPX     £0600
700C 25 L BCS
        *+F5 7003
700E 39 L RTS
```

Example of S-22 disassembly

```
  M>P
 ACE TRACE
  M>E
  E<LI
 00001    *SCREEN INVERT
 00002 ORG $7000
 00003   LDX £0400
 00004 LOOP LDA ,X
 00005   EORA £40
 00006   STA ,X+
 00007   CMPA £0600
 00008   BLO LOOP
 00009   RTS
```

Example of Ace Trace source file

```
M>P
ACE TRACE

M>T
START ADDR> 8000
A-B-D-X---Y---U---SP--EFHINZVC
003400FF00000000002FF

8000   7E   BB40 JMP   $BB40
A-B-D-X---Y---U---SP--EFHINZVC
003400FF00000000002FF

BB40   CC   0034 LDD   £$0034
A-B-D-X---Y---U---SP--EFHINZVC
003400FF00000000002FF

BB43   8E   FF00 LDX   £$FF00
A-B-D-X---Y---U---SP--EFHINZVC
```

Example of disassembly and register using "trace" facility of Ace Trace.

```
>W
WRITE TO "BASIC" ? Y
START   HEX:7000
ENDING HEX:700F
TITLE ?SCREEN INVERT
>G *
```

An example of the use of the S-22 "write" command.

```
10 REM S-22 DATA:SCREEN INVERT
20 DATA 142,4,0,166,132,136
30 DATA 64,167,128,140,6,0
40 DATA 37,245,57
```

◀ micro" — "that will serve you in years to come".

On major difference between S-22 and many other machine code tools for the Dragon is that it does *not* contain an assembler. The manual explains mnemonics but then goes on to claim that "symbolic assembly is more associated with 'development machines' where very large programs needing mass disk storage are written".

Assemblers

Of course learning all the op-codes by heart is undoubtedly good for the soul, but many excellent small system assemblers are available which make life so much easier for the machine code programmer.

S-22 is independent of Basic having its own input/output routines with autorepeat and diversion to the printer port available. Commands are entered by single key presses and a high degree of nesting is supported. A logical memory address system is used which saves a lot of unnecessary typing, and memory locations can be named (as for labels in an assembler).

A major feature claimed for S-22 is the tracing facility included which allows you to step through your machine code program examining register contents at each point. Breakpoints are set by automatically inserting the software interrupt op-code (&H3F) at appropriate points so that only routines resident in RAM can be traced. A disassembler is included and blocks of memory are easily relocated.

One interesting feature is the WRITE command which instantaneously transforms the contents of a series of defined memory locations into Basic data statements. This makes inclusion of machine code subroutines into Basic programs very straightforward.

Many internal S-22 routines are documented but of course these are only available with the cartridge in place — and you are warned against copying them! Some example programs are included, together with "pseudo data (?)" sheets on the 6809, 6883 SAM chip, and 6847 video display generator, together with some incomplete information on standard Dragon routines.

Our overall feelings are that, although it contains some novel features, the lack of an assembler (despite the price tag of £39.95), and the confused documentation makes this a rather unattractive package.

Ace Trace contains 9.25K of code which normally starts at &H600 (that is, the first graphics page) but since it was written in position independent code it can be located anywhere in memory between &H0600 and &H5B00 on the Dragon 32 (or even higher on the Dragon 64), providing considerable flexibility. This does, however, restrict the amount of memory available



for your programs, although this is unlikely to be of practical significance for most users.

If you leave Ace Trace in its default location on the graphics pages it will almost survive a system reset and Basic cold start (only six documented bytes need to be re-entered). The screen display is rather unusual in that green characters are produced on a black background. This is claimed to minimise eye strain, and made it obvious when you switched back and forth to Basic.

The manual is much briefer than the S-22 version, but gives a well-presented introduction to the system with some example programs. The monitor provided a standard set of memory examine and modify commands, together with S(shift) of blocks of memory, V(erify) of two blocks of memory, Disassembly and R(egister) display.

The Editor provides a comprehensive range of two-letter commands to construct your source file which can then be assembled to memory. FCB, FCC, FDB, DRG, and RMB directives, decimal, hex and binary number bases, addition, subtraction, ASCII characters and labels are all supported, and the line editor is easier to use than the Microsoft Basic version. Lines can be renumbered, so that it is easy to insert additional material.

The assembler is of the two pass type and plain English error messages indicating the defective line are produced. Source code can be saved and loaded within the editor/assembnler, and object code with the normal CSAVEM/CLOADM commands.

The Trace facility is very unusual and interesting as it runs in real time (at 1/500 speed) and allows tracing in both RAM and ROM. At each step disassembly and/or a register dump can be displayed, *without* setting breakpoints, and tracing can be stopped and started by pressing the space bar at any point.

Appealing

Although it does not have all the features of some other "all singing — all dancing" assemblers (for example, assembly direct to tape or disk) the Trace facility is a plus point and this is a very competitive product which should appeal to the novice. It is perhaps unkind to say that one of the most attractive features of Ace Trace to many users must be the price, but at only £14.95 it undercuts most of the opposition by a mile, which leaves you with more than enough spare cash to buy some decent books on machine code programming. This must be a winner.■

Dragon Ace Trace
Microtanic Computer Systems Ltd
16 Uplands Road
Dulwich
London SE22
Price £14.95

S-22 (UK Sole Distributor)
Ashby Computer Centre
247, Asby High Street
Scunthorpe
South Humberside
Price £39.95

Sounding off

. . . and show how to use machine code subroutines in Basic programs with an excerpt from their book Advanced Sound and Graphics for the Dragon

MACHINE CODE is the ultimate language of the microprocessor and even if you do not go to the extreme of writing programs entirely in machine code you can use subroutines written in it to improve your programs. We cannot even attempt to go into the details of 6809 code here, as that would take at least one whole book on its own (if you think that Basic is complicated then you will soon realise that machine code is rather like ancient Sumarian hieroglyphics by comparison).

We will therefore just explain how you can use machine code subroutines in your Basic programs, and give a few examples of sound and graphics routines. All data is given in hexadecimal base. That may make things look even more complicated but if you want to get into machine code you are going to have to get used to it sometime, so you might as well start now!

CLEARing space

First you need to reserve room in memory to store the machine code you wish to write so that it cannot be obliterated by Basic programs or variables. This is done with the CLEAR command, which is also used to reserve string space for Basic programs. To reserve space for machine code a second parameter must be added, which limits the highest address that Basic can use. Thus:

10 CLEAR 200

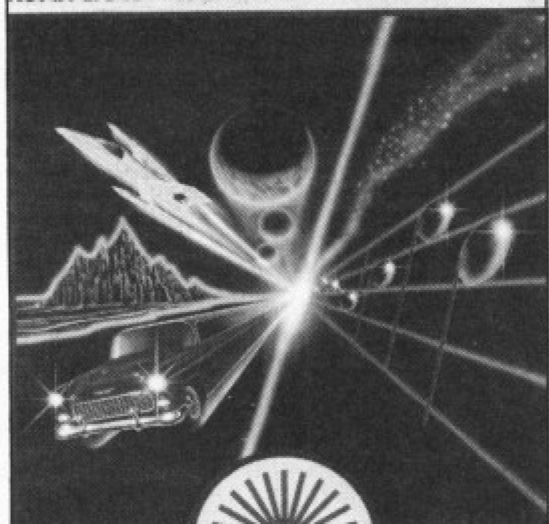
reserves 200 bytes for strings and:

10 CLEAR 200,&H6000

reserves 200 bytes for strings and the area above address &H6000 for machine code routines.

If you are going to do much work with machine code then you should invest in an editor/assembler but in the meantime this little program will allow you to enter code quite painlessly. There is no need to type "&H" to indicate hexadecimal numbers as this is added automatically. (Assembler listings are also included for the fortunate).

```
1000 CLS:PRINT"START ADDRESS";:I
NPUT ST$:ST=VAL("&H"+ST$)
1010 PRINT"START ENTERING DATA"
1020 PRINT HEX$(ST);:INPUT A$
```




```
1030 POKE ST,VAL("&H"+A$)
1040 ST=ST+1
1050 GOTO 1020
```

One major difficulty with machine code is that there are no error-trapping routines built in, so if you make a mistake entering the data the whole thing can quite easily crash.

Sound is turned on by loading a byte to address &HFF23, and the tone sounded depends on the value loaded into &HFF20. The duration depends on a time delay which you build into the program. This simple routine just makes a single sound. When you have entered the numbers in the second column of listing 1 from address &H6000 with the loader program above you call it by EXECuting from the start address.

You should be able to define up to 10 separate machine code routines on the Dragon within the USR n function but, due to a bug in the ROM, USR 0 is always called no matter what number you specify. Where no parameter need to be passed to the routine this causes no problem, as you can simply EXECute the starting address of the routine to call it.

100 EXEC&H6000

If you RUN this Basic program it will make a single sound and then report back with OK. If you add 30 GOTO 20 it will repeat until you press BREAK.

Where you need to be able to pass parameters to a machine code routine the simplest thing is to EXECute it after POKE values into it. The tone value used is stored at address &H6009, and the duration as a two byte number at addresses &H6006 and &H6007, so try experimenting by POKEing in different values. For example:

20 POKE &H6007,&HAF

If you are too lazy to think of values then try:

20 POKE &H6007,RND(&HFF)

although we warn you that it will sound a bit like morse code!

If you add

30 POKE &H6009.RND(HFF)

it will sound a little more like the orchestra tuning up.

Saving routines

The area of memory reserved for machine code is not saved by a normal Basic program CSAVE so you must CSAVEEM and take into account the address and length of the program. For example this first routine can be save by:

CSAVEM"sound",&H6000,&H6014,&H14

Machine code allows you to make interesting sounds as these can change tone very rapidly. For example the listing in program 2 produces a "phaser" type sound. It is entered from &H6100.

The Basic routine below calls it whenever a key is pressed, but POKEs different values into it according to whether A or B is pressed to produce two different sounds.

```
20 IF PEEK(337)=255 THEN 20 ELSE
   I=PEEK(135)
30 IF I=65 THEN POKE&H6001,FF EL
SE IF I=66 THEN POKE&H6001,3F EL
SE 20
40 EXEC&H6100
```

▶

```
DISASSEMBLE FROM=6000 TO=6015
6000 86 3F          LDA   #3F
6002 B7 FF 23       STA   $FF23
6005 8E 00 FF       LDX   #00FF
6008 C6 5F          LDB   #5F
600A F7 FF 20       STB   $FF20
600D 5C             INCB
600E 26 FA          BNE   600A
6010 30 1F          LEAX  -1,X
6012 26 F4          BNE   6008
6014 39             RTS
```

Listing 1

```
DISASSEMBLE FROM=6100 TO=6113
6100 86 3F          LDA   #3F
6102 B7 FF 23       STA   $FF23
6105 1F 89          TFR   A,B
6107 F7 FF 20       STB   $FF20
610A 5C             INCB
610B 26 FA          BNE   6107
610D 4C             INCA
610E 2A 01          BPL   6111
6110 4F             CLRA
6111 20 F2          BRA   6105
```

Listing 2

```
DISASSEMBLE FROM=6200 TO=6223
6200 86 3F        LDA   #3F
6202 B7 FF 23     STA   $FF23
6205 10 8E 62 50  LDY   #6250
6209 8E 00 80     LDX   #0080
620C E6 A0        LDB   ,Y+
620E C1 00        CMPB  #00
6210 27 13        BEQ   6225
6212 1F 98        TFR   B,A
6214 F7 FF 20     STB   $FF20
6217 5C           INCB
6218 26 FA        BNE   6214
621A 1F 89        TFR   A,B
621C 30 1F        LEAX  -1,X
621E 26 F4        BNE   6214
6220 20 E7        BRA   6209
6222 39           RTS
```

Listing 3

50 GOTO 20

It is often useful to be able to set up a sequence of tones to be played, and these are best organised in a "sound table" in memory. The program in listing 3 starts from &H6200 and reads tone bytes from listing 4 which starts at &H6250 and continues to sound these in sequence until it finds a zero.

Use the loader program to enter some values into this table and listen to the effect (you will have all the space up to &H64FF available). To speed things up POKE a smaller value into &H620B.

SOUND TABLE

&H	
6250	A3
6251	32
6252	A3
6253	37
6254	84
6255	56
6256	25
6257	89
6258	FF
6259	B5
6260	00

Listing 4

```
DISASSEMBLE FROM=6500 TO=650F
6500 8E 04 00     LDX   #0400
6503 A6 84        LDA   ,X
6505 88 40        EORA  #40
6507 A7 80        STA   ,X+
6509 8C 06 00     CMPX  #0600
650C 25 F5        BCS   6503
650E 39           RTS
```

Listing 5 (above) and 6 (below)

```
DISASSEMBLE FROM=6600 TO=660F
6600 86 00        LDA   #00
6602 C6 55        LDB   #55
6604 8E 06 00     LDX   #0600
6607 ED 81        STD   ,X++
6609 8C 17 FF     CMPX  #17FF
660C 25 F9        BCS   6607
660E 39           RTS
```

Normal and inverted characters on the text screen can easily be inter-converted with the listing in program 5 which makes an EOR (exclusive OR) of each character on the text screen with &H40. The Basic program below will invert the screen every time a key is pressed thus alternating between the two forms:

20 I$=INKEY$:IF I$="" THEN20
30 EXEC&H6500
40 GOTO 20

No doubt you will be impressed by the speed of this routine which is virtually instantaneous. If you want to invert only part of the screen change the two byte start and end address values in &H6501/&H6502 and &H650A/&650B, respectively. For example if you POKE &H650A with &H05 then only the top half of the screen will invert.

The routine in listing 6 allows you to fill certain bytes of the hi-res graphics screens with any number. The main use is in clearing parts of the screen or setting up a particular pattern. The routine places the values in &H6601 and &H6603 into consecutive bytes of the screen. This is particularly fast as it is done in one movement by treating the 8 bit A and B registers as a single 16 bit D register.

The start address of the area to be filled is at &H6605/&H6606 and the end address at &H660A/&H660B:

20 PMODE 3,1:SCREEN 1,0
30 EXEC&H6600
40 GOTO 40

If zeros are POKEd into &H6601 and &H6603 the top three-quarters of the screen will be cleared as for PCLS, and if &HFF is POKEd with zero and &H6603 with &HFF the result is red and green stripes. Experiment with other values remembering that each screen point is controlled by a pair of bits in PMODE 3. ■

A spe
age

***Michael Turner** explains h*
the intricacies of machine code, a

FOR A long time I have found Basic very slow. Although it may be quick and easy to work in Basic for the production of an original program, the running speed of a Basic program leaves much to be desired.

Even my change from the Sinclair ZX81 to the Dragon, did little to satisfy my ambition in this respect, despite the 400 per cent improvement in operating speed. (Experiments using both machines in fast mode showed that the Sinclair took 16 seconds to run a program compared with four seconds for the same program on the Dragon.)

Whenever action is required within the graphics of a games program, it is this slow operating speed that produces the greatest dissatisfaction to the DIY programmer. In one of my efforts, called "Space Shot", the action of the laser gun was especially irritating. It seemed an age before the shot from base reached the top of the screen. Not at all the high-speed, space action adventure I intended.

Fading hopes

The only answer was to master the intricacies of programming in machine code. Despite a year of searching through libraries and bookshops, I failed to identify and locate a suitable publication. All the books available seemed, to me, too difficult for the beginner. It must be remembered that machine code, like Basic, is machine specific. Books on machine code for the Dragon were not readily available and those for the Tandy, a machine which shares some features with the Dragon, are of limited value because of the differences in machine code application.

Just as hope was beginning to fade, I acquired a copy of the "Dream" Editor/Assembler



— a program/cassette previously marketed by Dragon Data and now available by mail order from it's author Mike Kerry of Grosvenor Software, 22 Grosvenor Road, Seaford, East Sussex. Even with this powerful new tool, the struggle was not over. It took some time to understand what I was doing with the

eedy space-
e solution

ains how the Dream Editor/Assembler helped him to master code, allowing the conversion of his Space shot program from Basic

package and to apply this new knowledge to the programs I wished to write.

The main difficulty is that the booklet supporting the Dream cassette assumes previous knowledge and experience of working machine code. Consequently, as a total beginner some weeks of trial and error (or should I say trial and crash) were necessary before I developed any understanding of the operating procedures.

Back to front

Although I began in the logical way — working through the book from the beginning and entering into my machine each of the examples, it was difficult to get to grips with what the documentation was saying. I decided to reverse the process. This time, I started the book at the back by entering in the demonstration programs and then consulting the dictionary of terms to discover what each line meant. This proved to be more rewarding. Through a process of substitution of values, I began to understand what the package was intended to achieve.

My first hesitant, independent venture (still with the booklet firmly clutched in my left hand) moved the text display one character space to the left. I prepared the program in object code as shown below:

```
LDX     #$0401
LDY     #$0400
LDA          ,X+
STA          ,Y+
CMPX    #$600
BEQ     $4E35
JMP     $4E28
RTS
```

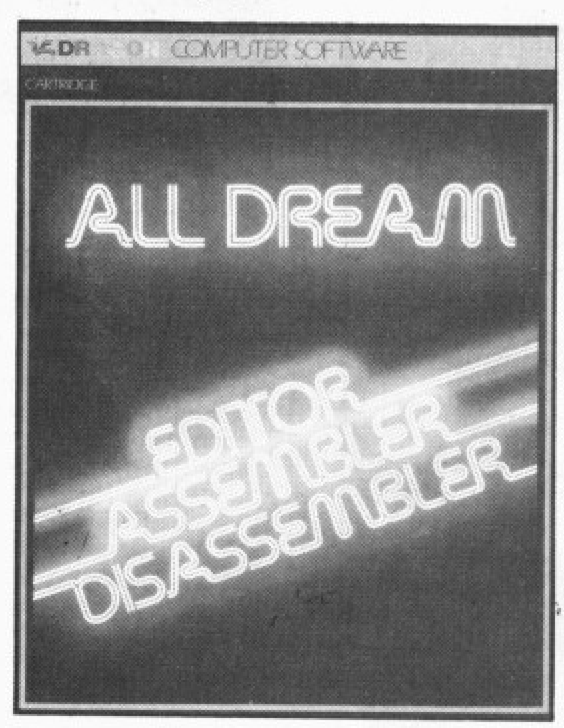
The Dream Editor/Assembler converts these values into machine code form (that is, strings of numbers buried within the memory of the computer). My curiosity made me anxious to see this conversion, which had been achieved by the assembler, displayed on the screen. A Basic routine allowed me to do this.

I remember well the feeling of quiet satisfaction as the screen began to fill with numbers and I knew that I had achieved my first objective. Having noted the values from the screen, I cleared the memory of the machine and poked in the program listed, starting at memory location 20001:

```
142   4   1  16 142  40 166
128 167 160 140   6
  0  39   4 126  78  40
 57
```

With the program re-entered, I used EXEC 20001 to get it to run. (I could have used DEF USR = 20001: A = USR 0(0) to achieve the same result.)

To understand the program when using the Editor/Assembler, it may be examined in its object code form. For example, in the first two terms in the program quoted above "LD" represents the load instruction while "X" and "Y" are the index registers doing the same job as the first part of a poke statement. The next term LDA,X+ loads into the Accumulator "A" the value in memory location "X" and then increases "X" by one.



The All Dream cartridge contains the Dream Editor/Assembler and a Monitor/Disassembler for use with Dream

STA,Y+ stores the value in Accumulator "A" at memory location "Y" and then increases "Y" by one. In the next line "X" is compared with #$600 which is the last position in the screen memory. The next two statements "BEQ" and "JMP" are equivalent of "GOTO" statements in Basic while "RTS" means return to entry (usually back to Basic).

As the objective was to improve the running speed, I tried to compare the program with its equivalent in Basic. Before I had reacted to the beginning of the machine code program, by pressing the button on my stop watch, the program had already completed its task. Clearly, I had the speed I needed and an accurate reading of that speed was irrelevant.

Some major problems remained. I still had to find a method of gaining access to high resolution graphics, the use of the sound modulator and how to input from the joysticks during a program. Many of these difficulties were overcome after I obtained a copy of the valuable pamphlet *Information for Machine Code Users* published by Dragon Data but which does not accompany the "Dream" package. (Limited copies of the pamphlet are available free from Touchmaster, Kenfig Industrial Estate, Margam, Port Talbot SA13 2PE Enclose a large SAE.)

Armed with this essential information I was able to convert my "Space Shot" program from Basic to machine code, as listed below, and to achieve the laser shot speed that my space fiction program required.

```
126  78 224 126  79  32 167
164 126  79 106 189 128  18
182   1  90 129   0  39   7 129
 63  39  28 126  78 111 142
  5 224 166 128 129 142  39
230  16 142   5 224 166 128
167 160 140   6   0  39  28 126
 78  74 142   5 255 166 130
129 132  39 205  16 142   5
255 166 130 167 162 140   5
223  39   3 126  78  99 142
  0   0 166 128 140   5 220  39
171 246 255   0 193 254  39
  7 193 126  39   3 126  78 114
142   5 224 166 128 129 142
 39   3 126  78  16 142
  0   0 134   0  76 230 130 129
 32  39   3 126  78 153 166
132 129 143  38 128 134 133
167 132 230 160  16 140
  0  14  39   3 126  78 151 134
143 198  32 167 132  58 140
  5 224  46   3 126  78 184 126
 78  36 142   5 224  16 142
  5 223 166 130 176 162 188
  4   0  39   3 126  78 209 126
 78  36 142   4   0 134 143
167 128 140   6   0  39   3 126
 78 229 142   5 224 134 142
198 132 167 128 231 132 134
128 198 143 142   5 160
167 128 140   5 192  39   3 126
 79   1 142   5 160 198   9 134
143  58 140   5 192  46   5 167
132 126  79  14 126  78  44 142
  4  32 166 128 129 191  39
 18 140   4  64  39   3 126  79
 35   1 142   4  32 134 191 167
132 126  78  44 142   4  64
 16 142   4  63 166 162 167 130
140   4  32  39 126  79  66 142
  5 160  16 142   5 159 166 128
167 160 140   5 192  34   3 126
 79 182   5 159 183   5 191
126  78  44 142   4  64 160
128 140   4  96  39  17 129 143
 39 245 136  13 183 255  34
134  13 183 255  34 126  78
224 142   5 192 134 143 167
128 140   5 224  39   3 126  79
138 126  78  44  57
```

Space shot program listing

Functional features

***Peter Whittaker** collates a collection of utility programs to create special functions on the Dragon 32*

SPECIAL FUNCTIONS on the Dragon 32 can be created using this program which makes use of the RTS subroutines called by the Dragon whenever a ROM routine is used. Every time the keyboard is pressed the ROM calls location 362 and finding the RTS instruction returns. Replacing this with a JMP to our routine the Dragon can be redirected to perform special functions.

The program is a collection of utility programs. I have provided two sets of functions, the first set being tape recorder commands, and the second set being graphics commands. Pressing the <down arrow> twice will call up the menu for the tape recorder functions, whilst pressing the <right arrow> twice will do the same for the graphics. Press any key to escape from the menu. The functions are numbered between 0-9, but any of the keys on the keyboard could have been used.

To call a function press the relevant arrow and then the number desired. Now instead of having to repeatedly type CLOAD <ENTER> when trying to load from the middle of a program on tape, just press the down arrow and then the "2" (two key presses instead of six.) The graphics commands are similar abbreviations of usual Dragon commands, with the exception of the invert screen routine which has been added.

When a key is pressed the program checks to see if either of the toggles have been set for the function sets. If not the program checks if either of the arrow keys have been pressed, and if so sets the relevant toggle and returns to Basic. If the appropriate toggle has been set the program checks to see if the key pressed corresponds to a function number or the menu and if so, clears the toggle and executes the function. If not the toggle is cleared and then the program returns to Basic.

The functions themselves are largely a matter of calling Basic ROM routines from machine code. In brief there are eight steps to follow:

- Create a tokenised Basic line.
- Save the pointer at &HA6. (LDX >$A6:PSHS X)
- Point X register to start of Basic line. (LEAX @BASIC, PCR)
- Store X at $A6. (STX >$A6)
- Load the A register with the first character. (LDA ,X)
- Clear the condition code register. (ANDCC #$FE)
- EXEC ROM routine. (JSR 47134)
- Restore pointer. (PULS X:STX >$A6)

It is not possible to extend this program from Basic, but is entered with an assembler it can be easily modified. To increase the number of functions in each set, alter the key comparisons in blocks 50 and 170, and add your own extra functions. To increase the number of function sets (that is keys calling the functions) create extra toggles in block 20, and extend the key check in block 30.

If entered from the Basic loader the program can be saved as machine code by CSAVEM"FUNCTIONS"&H7C9D, &H7FE6,&H7C9D. Remember to CLEAR 200,31900 before reloading. To enable the function keys enter EXEC&H7C9D and to disable POKE 326,57.■

```
DOWN ARROW FUNCTIONS
1) SKIPF over a Program.
2) CLOAD a Program.
3) CSAVE a Program.
4) LIST a Program.
5) MOTORON & AUDIOON.
6) MOTOROFF & AUDIOOFF
```

```
RIGHT ARROW FUNCTIONS
0) PCLS the graphics screen.
9) Invert the graphics screen.
8) CSAVEM the graphics screen.
7) Display graphics screen.
6) CLOADM graphics screen etc.
```

Assembler listings for function keys

```
7C9D
7C9D 8E7CAB
7CA0 BF016B
7CA3 867E
7CA5 B7016A
7CA8 39
7CA9 00
7CAA 00
7CAB 3416
7CAD F67CA9
7CB0 261E
7CB2 F67CAA
7CB5 102601A3
7CB9 810A
7CBB 2707
7CBD 8109
7CBF 2709
7CC1 3516
7CC3 39
7CC4 7C7CA9
7CC7 3516
7CC9 39
7CCA 7C7CAA
7CCD 3516
7CCF 39
7CD0 7F7CA9
7CD3 8131
7CD5 271F
7CD7 8132
7CD9 2737
7CDB 8133
7CDD 274F
```

```
290      PRT
 20 @START  LDX  #@BEGIN
 20      STX  363
 20      LDA  #126
 20      STA  362
 20      RTS
 20 @TOGG1  FCB  0
 20 @TOGG2  FCB  0
 30 @BEGIN  PSHS  D,X
 30      LDB  @TOGG1
 30      BNE  @FUNC1
 30      LDB  @TOGG2
 30      LBNE  @FUNC2
 30      CMPA  #10
 30      BEQ  @ON1
 30      CMPA  #9
 30      BEQ  @ON2
 30      PULS  D,X
 30      RTS
 40 @ON1  INC  @TOGG1
 40      PULS  D,X
 40      RTS
 40 @ON2  INC  @TOGG2
 40      PULS  D,X
 40      RTS
 50 @FUNC1  CLR  @TOGG1
 50      CMPA  #49
 50      BEQ  @FN1
 50      CMPA  #50
 50      BEQ  @FN2
 50      CMPA  #51
 50      BEQ  @FN3
```

```
7CDF 8134
7CE1 2767
7CE3 8135
7CE5 277F
7CE7 8136
7CE9 10270099
7CED 810A
7CEF 102700A3
7CF3 3516
7CF5 39
7CF6 9EA6
7CF8 3410
7CFA 308D0013
7CFE 9FA6
7D00 A684
7D02 1CFE
7D04 BDB81E
7D07 3510
7D09 9FA6
7D0B 3516
7D0D 7E8371
7D10 A500
7D12 9EA6
7D14 3410
7D16 308D0013
7D1A 9FA6
7D1C A684
7D1E 1CFE
7D20 BDB6D4
7D23 3510
7D25 9FA6
```

```
 50      CMPA  #52
 50      BEQ  @FN4
 50      CMPA  #53
 50      BEQ  @FN5
 50      CMPA  #54
 50      LBEQ  @FN6
 50      CMPA  #10
 50      LBEQ  @TITLE1
 50      PULS  D,X
 50      RTS
 60 @FN1  LDX  >$A6
 60      PSHS  X
 60      LEAX  @SKIPF,PCR
 60      STX  >$A6
 60      LDA  ,X
 60      ANDCC  #$FE
 60      JSR  47134
 60      PULS  X
 60      STX  >$A6
 60      PULS  D,X
 60      JMP  33649
 60 @SKIPF  FCB  165,0
 70 @FN2  LDX  >$A6
 70      PSHS  X
 70      LEAX  @CLOAD,PCR
 70      STX  >$A6
 70      LDA  ,X
 70      ANDCC  #$FE
 70      JSR  46804
 70      PULS  X
 70      STX  >$A6
```

Continued on page 30

```
7D27 3516                70        PULS  D,X
7D29 7E8371              70        JMP  33649
7D2C 9900                70 @CLOAD  FCB  153,0
7D2E 9EA6                80 @FN3  LDX  >$A6
7D30 3410                80        PSHS  X
7D32 308D0013            80        LEAX  @CSAVE,PCR
7D36 9FA6                80        STX  >$A6
7D38 A684                80        LDA  ,X
7D3A 1CFE                80        ANDCC  #$FE
7D3C BDB682              80        JSR  46722
7D3F 3510                80        PULS  X
7D41 9FA6                80        STX  >$A6
7D43 3516                80        PULS  X,D
7D45 7E8371              80        JMP  33649
7D48 9A00                80 @CSAVE  FCB  154,0
7D4A 9EA6                90 @FN4  LDX  >$A6
7D4C 3410                90        PSHS  X
7D4E 308D0013            90        LEAX  @LIST,PCR
7D52 9FA6                90        STX  >$A6
7D54 A684                90        LDA  ,X
7D56 1CFE                90        ANDCC  #$FE
7D58 BD8EAA              90        JSR  36522
7D5B 3510                90        PULS  X
7D5D 9FA6                90        STX  >$A6
7D5F 3516                90        PULS  D,X
7D61 7E8371              90        JMP  33649
7D64 9500                90 @LIST  FCB  149,0
7D66 BD8015             100 @FN5  JSR  $8015
7D69 B6FF23             100       LDA  65315
7D6C 8A08               100       ORA  #8
7D6E B7FF23             100       STA  65315
7D71 B6FF01             100       LDA  65281
7D74 8A08               100       ORA  #8
7D76 B7FF01             100       STA  65281
7D79 B6FF03             100       LDA  65283
7D7C 84F7               100       ANDA  #247
7D7E B7FF03             100       STA  65283
7D81 3516               100       PULS  D,X
7D83 7E8371             100       JMP  33649
7D86 BD8018             110 @FN6  JSR  $8018
7D89 B6FF23             110       LDA  $FF23
7D8C 84F7               110       ANDA  #247
7D8E B7FF23             110       STA  $FF23
7D91 3516               110       PULS  D,X
7D93 7E8371             110       JMP  33649
7D96 8680               120 @TITLE1  LDA  #128
7D98 BD7FD8             120       JSR  @CLS
7D9B 8E0406             120       LDX  #1030
7D9E BF0088             120       STX  $88
7DA1 8E7DCF             130       LDX  #@TLE1A
7DA4 BD7DAA             130       JSR  @PRT
7DA7 3516               130       PULS  D,X
7DA9 39                 130       RTS
7DAA A680               140 @PRT  LDA  ,X+
7DAC 810D               140       CMPA  #13
7DAE 2709               140       BEQ  @NWLN
7DB0 81FF               140       CMPA  #255
7DB2 2712               140       BEQ  @DONE1
7DB4 BD800C             140       JSR  $800C
7DB7 20F1               140       BRA  @PRT
7DB9 FC0088             140 @NWLN  LDD  $88
7DBC C4E0               140       ANDB  #224
7DBE C30020             140       ADDD  #32
7DC1 FD0088             140       STD  $88
7DC4 20E4               140       BRA  @PRT
7DC6 BDA0EA             140 @DONE1  JSR  41194
7DC9 8660               140       LDA  #96
7DCB BD7FD8             140       JSR  @CLS
7DCE 39                 140       RTS
7DCF 736574806F6E6580   150 @TLE1A  FCC  "set",
     128, "one",128,"functions",13,13,"
     1",128,"skipf",128,"over",128,"a",128
7DF1 70726F6772616D0D   150       FCC  "Program",13,
     "2",128,"cload",128,"a",128,"p
     rogram",13,"3",128,"csave"
7E12 80618070726F6772   150       FCC  128,"a",128,
     "Program",13,"4",128,"list",128
     ,"a",128,"Program",13
7E2E 35806D6F746F726F   160       FCC  "5",
     128,"motoron" ,128,"and",128,"audioon",1
3,"6",128,"motoroff",128,"and",128,"audiooff",255
7E5C 7F7CAA             170 @FUNC2  CLR  @TOGG2
7E5F 8130               170       CMPA  #48
7E61 271D               170       BEQ  @FC0
7E63 8139               170       CMPA  #57
7E65 272B               170       BEQ  @FC9
7E67 8138               170       CMPA  #56
7E69 2739               170       BEQ  @FC8
7E6B 8137               170       CMPA  #55
7E6D 1027008E           170       LBEQ  @FC7
7E71 8136               170       CMPA  #54
7E73 10270093           170       LBEQ  @FC6
7E77 8109               170       CMPA  #9
7E79 102700AA           170       LBEQ  @TITLE2
7E7D 3516               170       PULS  D,X
7E7F 39                 170       RTS
7E80 BE00BA             180 @FC0  LDX  $BA
7E83 4F                 180       CLRA
7E84 A780               180 @FC1A  STA  ,X+
7E86 BC00B7             180       CMPX  $B7
7E89 25F9               180       BLO  @FC1A
7E8B A784               180       STA  ,X
7E8D 3516               180       PULS  D,X
7E8F 7E8371             180       JMP  33649
7E92 BE00BA             190 @FC9  LDX  $BA
7E95 A684               190 @FC2A  LDA  ,X
7E97 43                 190       COMA
7E98 A780               190       STA  ,X+
7E9A BC00B7             190       CMPX  $B7
7E9D 25F6               190       BLO  @FC2A
7E9F 3516               190       PULS  D,X
7EA1 7E8371             190       JMP  33649
7EA4 3516               200 @FC8  PULS  D,X
7EA6 9EA6               200       LDX  >$A6
7EA8 3410               200       PSHS  X
7EAA 308D0011           200       LEAX  @CSAVEM,PCR
7EAE 9FA6               200       STX  >$A6
7EB0 A684               200       LDA  ,X
7EB2 1CFE               200       ANDCC  #$FE
7EB4 BDB682             200       JSR  46722
7EB7 3510               200       PULS  X
7EB9 9FA6               200       STX  >$A6
7EBB 7E8371             200       JMP  33649
7EBE 9A4D224752415048   200 @CSAVEM  FCC  154,"M"
     "GRAPHICS"",(",255,140
7ECE 282648424129C532   200       FCC  "(&HBA)"197,
     "256",195,255
7EDA 8C28264842422929   200       FCC  140,"(&HBB)),
     (",255,140,"(&HB7)",197,"256", 195
7EF1 FF8C282648423829   210       FCC  255,140,
     "(&HB8)),359",0
7EFF BDAA01             220 @FC7  JSR  43521
7F02 BDA0EA             220       JSR  41194
7F05 3516               220       PULS  D,X
7F07 7E8371             220       JMP  33649
7F0A 9EA6               230 @FC6  LDX  >$A6
7F0C 3410               230       PSHS  X
7F0E 308D0013           230       LEAX  @CLOADM,PCR
7F12 9FA6               230       STX  >$A6
7F14 A684               230       LDA  ,X
7F16 1CFE               230       ANDCC  #$FE
7F18 BDB6D4             230       JSR  46804
7F1B 3510               230       PULS  X
7F1D 9FA6               230       STX  >$A6
7F1F 3516               230       PULS  D,X
7F21 7E8371             230       JMP  33649
7F24 994D00             230 @CLOADM  FCB  153,77,0
7F27 8680               240 @TITLE2  LDA  #128
7F29 BD7FD8             240       JSR  @CLS
7F2C 8E0406             240       LDX  #1030
7F2F BF0088             240       STX  $88
7F32 8E7F40             250       LDX  #@TLE2A
7F35 BD7DAA             250       JSR  @PRT
7F38 8660               250       LDA  #96
7F3A BD7FD8             250       JSR  @CLS
7F3D 3516               250       PULS  D,X
7F3F 39                 250       RTS
7F40 7365748074776F80   260 @TLE2A  FCC  "set"
     ,128,"two",128,"functions",13,13," 0",128,
     "pcls",128,"the",128,"graphics",128,"screen",13
7F6E 3980696E76657274   260       FCC  "9",
     128,"invert" ,128,"the",128,"graphics",1
     28,"screen",13
7F8B 388063736176656D   260       FCC  "8",128,
     "csavem", 128,"the",128,"graphics",1
     28,"screen",13
7FA8 3780646973706C61   270       FCC  "7",128,
     "display",128,"graphics",128,"scree
n",13,"6",128,"cloadm",128,"graphics",128,"etc",255
7FD5 8E0400             280 @CLS  LDX  #1024
7FD8 BF0088             280       STX  $88
7FDE A780               280 @CLS1  STA  ,X+
7FE0 8C0600             280       CMPX  #1536
7FE3 25F9               280       BLO  @CLS1
7FE5 39                 280       RTS
7FE6                    290       END  @START
```

Basic loader for function keys

```
10 CLEAR 200,31900
20 A=&H7C9D:RESTORE
30 READ B:IF B=999 THEN END
40 POKE A,B:A=A+1:GOTO 30
 50 DATA 142 , 124 , 171 , 191 , 1 , 107 , 134 , 126 , 183 , 1 , 106 , 57 , 0 ,
0 , 52 , 22 , 246 , 124 , 169 , 38
 60 DATA 30 , 246 , 124 , 170 , 16 , 38 , 1 , 163 , 129 , 10 , 39 , 7 , 129 , 9
, 39 , 9 , 53 , 22 , 57 , 124
 70 DATA 124 , 169 , 53 , 22 , 57 , 124 , 124 , 170 , 53 , 22 , 57 , 127 , 124 ,
 169 , 129 , 49 , 39 , 31 , 129 , 50
 80 DATA 39 , 55 , 129 , 51 , 39 , 79 , 129 , 52 , 39 , 103 , 129 , 53 , 39 , 12
7 , 129 , 54 , 16 , 39 , 0 , 153
 90 DATA 129 , 10 , 16 , 39 , 0 , 163 , 53 , 22 , 57 , 158 , 166 , 52 , 16 , 48
, 141 , 0 , 19 , 159 , 166 , 166
 100 DATA 132 , 28 , 254 , 189 , 184 , 30 , 53 , 16 , 159 , 166 , 53 , 22 , 126
, 131 , 113 , 165 , 0 , 158 , 166 , 52
 110 DATA 16 , 48 , 141 , 0 , 19 , 159 , 166 , 166 , 132 , 28 , 254 , 189 , 182
, 212 , 53 , 16 , 159 , 166 , 53 , 22
 120 DATA 126 , 131 , 113 , 153 , 0 , 158 , 166 , 52 , 16 , 48 , 141 , 0 , 19 ,
159 , 166 , 166 , 132 , 28 , 254 , 189
 130 DATA 182 , 130 , 53 , 16 , 159 , 166 , 53 , 22 , 126 , 131 , 113 , 154 , 0
, 158 , 166 , 52 , 16 , 48 , 141 , 0
 140 DATA 19 , 159 , 166 , 166 , 132 , 28 , 254 , 189 , 142 , 170 , 53 , 16 , 15
9 , 166 , 53 , 22 , 126 , 131 , 113 , 149
 150 DATA 0 , 189 , 128 , 21 , 182 , 255 , 35 , 138 , 8 , 183 , 255 , 35 , 182 ,
 255 , 1 , 138 , 8 , 183 , 255 , 1
 160 DATA 182 , 255 , 3 , 132 , 247 , 183 , 255 , 3 , 53 , 22 , 126 , 131 , 113
, 189 , 128 , 24 , 182 , 255 , 35 , 132
 170 DATA 247 , 183 , 255 , 35 , 53 , 22 , 126 , 131 , 113 , 134 , 128 , 189 , 1
27 , 216 , 142 , 4 , 6 , 191 , 0 , 136
 180 DATA 142 , 125 , 207 , 189 , 125 , 170 , 53 , 22 , 57 , 166 , 128 , 129 , 1
3 , 39 , 9 , 129 , 255 , 39 , 18 , 189
 190 DATA 128 , 12 , 32 , 241 , 252 , 0 , 136 , 196 , 224 , 195 , 0 , 32 , 253 ,
 0 , 136 , 32 , 228 , 189 , 160 , 234
 200 DATA 134 , 96 , 189 , 127 , 216 , 57 , 115 , 101 , 116 , 128 , 111 , 110 ,
101 , 128 , 102 , 117 , 110 , 99 , 116 , 105
 210 DATA 111 , 110 , 115 , 13 , 13 , 49 , 128 , 115 , 107 , 105 , 112 , 102 , 1
28 , 111 , 118 , 101 , 114 , 128 , 97 , 128
 220 DATA 112 , 114 , 111 , 103 , 114 , 97 , 109 , 13 , 50 , 128 , 99 , 108 , 11
1 , 97 , 100 , 128 , 97 , 128 , 112 , 114
 230 DATA 111 , 103 , 114 , 97 , 109 , 13 , 51 , 128 , 99 , 115 , 97 , 118 , 101
 , 128 , 97 , 128 , 112 , 114 , 111 , 103
 240 DATA 114 , 97 , 109 , 13 , 52 , 128 , 108 , 105 , 115 , 116 , 128 , 97 , 12
8 , 112 , 114 , 111 , 103 , 114 , 97 , 109
 250 DATA 13 , 53 , 128 , 109 , 111 , 116 , 111 , 114 , 111 , 110 , 128 , 97 , 1
10 , 100 , 128 , 97 , 117 , 100 , 105 , 111
 260 DATA 111 , 110 , 13 , 54 , 128 , 109 , 111 , 116 , 111 , 114 , 111 , 102 ,
102 , 128 , 97 , 110 , 100 , 128 , 97 , 117
 270 DATA 100 , 105 , 111 , 111 , 102 , 102 , 255 , 127 , 124 , 170 , 129 , 48 ,
 39 , 29 , 129 , 57 , 39 , 43 , 129 , 56
 280 DATA 39 , 57 , 129 , 55 , 16 , 39 , 0 , 142 , 129 , 54 , 16 , 39 , 0 , 147
, 129 , 9 , 16 , 39 , 0 , 170
 290 DATA 53 , 22 , 57 , 190 , 0 , 186 , 79 , 167 , 128 , 188 , 0 , 183 , 37 , 2
49 , 167 , 132 , 53 , 22 , 126 , 131
 300 DATA 113 , 190 , 0 , 186 , 166 , 132 , 67 , 167 , 128 , 188 , 0 , 183 , 37
, 246 , 53 , 22 , 126 , 131 , 113 , 53
 310 DATA 22 , 158 , 166 , 52 , 16 , 48 , 141 , 0 , 17 , 159 , 166 , 166 , 132 ,
 28 , 254 , 189 , 182 , 130 , 53 , 16
 320 DATA 159 , 166 , 126 , 131 , 113 , 154 , 77 , 34 , 71 , 82 , 65 , 80 , 72 ,
 73 , 67 , 83 , 34 , 44 , 40 , 255
 330 DATA 140 , 40 , 38 , 72 , 66 , 65 , 41 , 197 , 50 , 53 , 54 , 195 , 255 , 1
40 , 40 , 38 , 72 , 66 , 66 , 41
 340 DATA 41 , 44 , 40 , 255 , 140 , 40 , 38 , 72 , 66 , 55 , 41 , 197 , 50 , 53
 , 54 , 195 , 255 , 140 , 40 , 38
 350 DATA 72 , 66 , 56 , 41 , 41 , 44 , 51 , 53 , 57 , 0 , 189 , 170 , 1 , 189 ,
 160 , 234 , 53 , 22 , 126 , 131
 360 DATA 113 , 158 , 166 , 52 , 16 , 48 , 141 , 0 , 19 , 159 , 166 , 166 , 132
 , 28 , 254 , 189 , 182 , 212 , 53 , 16
 370 DATA 159 , 166 , 53 , 22 , 126 , 131 , 113 , 153 , 77 , 0 , 134 , 128 , 189
 , 127 , 216 , 142 , 4 , 6 , 191 , 0
 380 DATA 136 , 142 , 127 , 64 , 189 , 125 , 170 , 134 , 96 , 189 , 127 , 216 ,
53 , 22 , 57 , 115 , 101 , 116 , 128 , 116
 390 DATA 119 , 111 , 128 , 102 , 117 , 110 , 99 , 116 , 105 , 111 , 110 , 115 ,
 13 , 13 , 48 , 128 , 112 , 99 , 108 , 115
 400 DATA 128 , 116 , 104 , 101 , 128 , 103 , 114 , 97 , 112 , 104 , 105 , 99 ,
115 , 128 , 115 , 99 , 114 , 101 , 101 , 110
 410 DATA 13 , 57 , 128 , 105 , 110 , 118 , 101 , 114 , 116 , 128 , 116 , 104 ,
101 , 128 , 103 , 114 , 97 , 112 , 104 , 105
 420 DATA 99 , 115 , 128 , 115 , 99 , 114 , 101 , 101 , 110 , 13 , 56 , 128 , 99
 , 115 , 97 , 118 , 101 , 109 , 128 , 116
 430 DATA 104 , 101 , 128 , 103 , 114 , 97 , 112 , 104 , 105 , 99 , 115 , 128 ,
115 , 99 , 114 , 101 , 101 , 110 , 13 , 55
 440 DATA 128 , 100 , 105 , 115 , 112 , 108 , 97 , 121 , 128 , 103 , 114 , 97 ,
112 , 104 , 105 , 99 , 115 , 128 , 115 , 99
 450 DATA 114 , 101 , 101 , 110 , 13 , 54 , 128 , 99 , 108 , 111 , 97 , 100 , 10
9 , 128 , 103 , 114 , 97 , 112 , 104 , 105
 460 DATA 99 , 115 , 128 , 101 , 116 , 99 , 255 , 142 , 4 , 0 , 191 , 0 , 136 ,
167 , 128 , 140 , 6 , 0 , 37 , 249
 470 DATA 57 ,999
```

Back Track

Take advantage of Incentive's special launch offer for readers of Dragon User

A SPECIAL LAUNCH offer, exclusive to readers of *Dragon User*, is being offered by Incentive Software to coincide with the release of Incentive's latest game **Back Track**, for the Dragon 32. For a limited period only, readers are entitled to £1.50 off the recommended retail price of £6.50. The offer closes on October 31.

Back Track consists of the attempts of Eddie to escape the innermost depths of the mad professor's labyrinth. The professor has created a series of five tests of increasing complexity to see if Eddie can come through without losing the will to live.

Items of fruit help Eddie to restore his strength, while skeletons of previous victims sap his strength. There are also snakes that sporadically come awake that Eddie must avoid at all costs.

The display shows the plan view of one of the rooms with Eddie in the middle. Movement is achieved using the cursor keys, though you can define your own key controls as directed by the program. Pressing the "M" key displays a map of the maze provided Eddie has managed to locate it.

Objects are automatically picked up as Eddie enters a room and his willpower is displayed at the left of the screen and automatically restored when appropriate. To escape, Eddie must search for the five keys that will allow him to head for the exit and freedom.

To add incentive to the game, there is a "Back Track Champ" competition. On finishing the final stage of the game, watch the screen and complete the entry form enclosed with the game. Five winners will then be invited to attend a play-off at Incentive's offices. The winner will win a complete Cumana Disk Drive system worth nearly £300.

To order your game simply cut out the coupon on this page and send it, together with a cheque or postal order for £5 to: Incentive Software, 54 London Street, Reading RG1 4SQ.

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DRAGON OPEN FILE

Send us your Dragon programs, beginning with a general description and then explaining how the program is constructed. Take care that the listings are all bug free, enclosing a cassette and, if possible, a printout. We pay £6 for each original bug-free program published, double for the program of the month. If you have any problems with the listings, please send your queries to the appropriate author, *Dragon User*, 12-13 Little Newport Street, London WC2R 3LD.

Snake

From David Harman in Kent

IN THIS game, a snake wriggles around the screen and you must shoot from the centre of the screen at the end segments of its tail.

There are two levels of play and you can decide on how many shots you would like. Level one is easier and the more shots you take the better chance you have of winning.

A score may only be made if the snake is completely destroyed. Cursor keys control the shell's direction, and with very careful use, you can keep one shell on the screen for the whole game.

Program Notes

70-160	Draw title screen
180-220	Data for title screen
230-300	Initiate variables
310-410	Draw game screen
420-500	Shot?
510-580	Hit routine
590-690	Check that shell is still on screen
700-750	You are dead!
760-830	Play again
840-890	You have won
900-950	Run out of shells
960-1200	Instructions

```
10 REM       SNAKE      ---
20 REM--- DAVID HARMAN  ---
30 REM---    VERSION 9   ---
40 DIM X(180):DIM Y(180)
50 GOSUB 960
60 GOSUB 1040
70 REM--- TITLE SCREEN ---
80 FOR X=0 TO 63
90 FOR Y=0 TO 30 STEP 2
100 SET(X,Y,0)
110 NEXT:NEXT
120 RESTORE
130 FOR K=1 TO 70
140 READ PO
150 POKEPO+1024,207
160 NEXT
170 REM--- DATA FOR SNAKE. ---
180 DATA97,98,99,100,101,103,107,1
10,111,112,115,118,120,121,122,123
,124
190 DATA129,135,136,139,141,145,14
7,149,152
200 DATA161,162,163,164,165,167,16
9,171,173,174,175,176,177,179,180,
184,185,186
210 DATA197,199,202,203,205,209,21
1,213,216
220 DATA225,226,227,228,229,231,23
5,237,241,243,246,248,249,250,251,
252,254
230 REM--- INITIATE ---
240 X1=30:Y1=16:X2=30:Y2=16:C=1:L=
0:R=11
250 REM--- SET COURSE OF SNAKE ---
260 FOR K=2 TO 60:X(C)=K:Y(C)=4:C=
C+1:NEXT
270 FOR K=4 TO 28:X(C)=60:Y(C)=K:C
=C+1:NEXT
280 FOR K=60 TO 2 STEP-1:X(C)=K:Y(
C)=29:C=C+1:NEXT
290 FOR K=28 TO 4 STEP-1:X(C)=2:Y(
C)=K:C=C+1:NEXT
300 FOR K=2 TO 12:X(C)=K:Y(C)=4:C=
C+1:NEXT
310 REM--- MAIN GAME ---
320 CLS0
330 PRINT@0,10-L;" SEGMENTS ":PRIN
T@16,LE-S;" SHOTS "
340 PRINT@31,CHR$(138);
350 FOR Y=3 TO 30:SET(0,Y,2):SET(6
2,Y,2):NEXT
360 FOR X=0 TO 62:SET(X,2,2):SET(X
,31,2):NEXT
370 SET(X1,Y1,7)
380 SET(X1-1,Y1,7)
390 SET(X1+1,Y1,7)
400 SET(X1,Y1-1,7)
410 SET(X1,Y1+1,7)
420 REM-- FIRE? ---
430 IN$=INKEY$:IF IN$=""THEN 500
440 IF SK=1 THEN A=0:B=0 ELSE 450
450 IF IN$=CHR$(8)THEN A=-1
460 IF IN$=CHR$(9)THEN A=1
470 IF IN$=CHR$(10)THEN B=1
480 IF IN$=CHR$(94)THEN B=-1
490 SOUND125,1
500 IF A<>0 OR B<>0 THEN GOSUB 570
510 REM--- HIT? ---
520 IF X2=X(R-9+L)AND Y2=Y(R-9+L)T
HEN L=L+1:SOUND1,1:PRINT@0,10-L;"
SEGMENTS ";
530 IF L>9 THEN PRINT@168,"well"CH
R$(128)"done";:FOR K=0 TO 1000:NEX
T:GOTO 750
```

Continued on page 35

```
540 R=R+1:IF R>179 THEN R=11
550 GOSUB 670
560 GOTO 370
570 RESET(X2,Y2)
580 X2=X2+A:Y2=Y2+B
590 REM--- SHOT OFF SCREEN? --
600 IF X2<2 OR X2>60 THEN A=0:GOTO
 640
610 IF Y2<4 OR Y2>29 THEN B=0:GOTO
 640
620 SET(X2,Y2,5)
630 RETURN
640 X2=X1:Y2=Y1:S=S+1
650 PRINT@16,LE-S;" SHOTS ";
660 IF S>(LEVEL-1) THEN 710
670 SET(X(R),Y(R),1)
680 RESET(X(R-(10-L)),Y(R-(10-L)))
690 RETURN
700 REM--- GOOD/BAD LUCK? --
710 CLS0
720 PRINT@134,"you"CHR$(128)"are"C
HR$(128)"dead";
730 SOUND10,15
740 GOTO 900
750 GOSUB 840
760 PRINT@368,"play"CHR$(128)"agai
n"CHR$(128)CHR$(123)"y"CHR$(124)"n
"CHR$(125);
770 IN$=INKEY$:IF IN$=""THEN 770
780 IF IN$="Y"THEN 60
790 IF IN$<>"N"THEN 770
800 CLS RND(9)-1
810 PRINT@130,"E N D  O F  P R O G
 R A M";
820 PRINT@416
830 END
840 CLS0
850 PRINT@66,"YOU SCORED"((60-LE)-
S)*10"POINTS"
860 IF ((60-LE)-S)*10>HI THEN HI=(
(60-LE)-S)*10
870 PRINT@130,"HIGH SCORE"HI"POINT
S"
880 PRINT@194,"        WELL DONE"
890 RETURN
900 CLS0
910 PRINT@66,"YOU DIDN'T GET IT AL
L"
920 IF L=1 THEN SE$="SEGMENT" ELSE
 SE$="SEGMENTS"
930 PRINT@130,"YOU HIT"L;SE$
940 PRINT@194,"        HARD LUCK"
950 GOTO 760
960 REM-- OUTLINE --
970 CLS
980 PRINT@33,"THE PROGRAM YOU ARE
ABOUT TO
        PLAY IS CALLED 'SNAKE' IN
 WHICH
     A SNAKE WRIGGLES AROUND THE E
DGE
 OF THE LAWN READY TO POUNCE ON
"
990 PRINT"YOU IF YOU DON'T SHOOT H
IM
     STARTING AT THE END OF HIS T
AIL
  AND WORKING UP TO HIS HEAD."
1000 PRINT@485,"PRESS A KEY...";
1010 EXEC 41194
1020 RETURN
1030 REM-- SKILL FACTOR --
1040 CLS
1050 PRINT@32," USE THE ARROW KEYS
 TO DETERMINE
          THE DIRECTION OF YOUR G
UN."
1060 PRINT.," ENTER HERE WHICH SHO
TS LEVEL
        YOU REQUIRE, THE LEVEL Æ1
-5Å
     IS THE NUMBER OF SHOTS YOU HA
VE
 AT EACH TARGET....";
1070 REM--- WHICH LEVEL? --
1080 INPUT LE
1090 IF LE>5 OR LE<1 THEN 1040
1100 REM--- SHOTS=LEVEL X 10 --
1110 BE=LE*10
1120 LE=INT(BE)
1130 S=0
1140 A=0:B=0
1150 CLS
1160 PRINT:PRINT" WHICH SKILL LEVE
L Æ1-2Å


            1Å EASY (STRAIGHT SHOT
S)
       2Å DIFFICULT (DIAGONAL SHO
TS)"
1170 PRINT:PRINT
1180 INPUT" ENTER LEVEL...";SK
1190 IF SK<>1 AND SK<>2 THEN 1150
1200 RETURN
```

Mastermind

From Alan Fyfe in Edinburgh

THIS IS A computer-version of the popular board game where one player selects a number of coloured pegs and puts them in a sequence hidden from the other player. The second player has to deduce the colours by attempting to duplicate the hidden pegs.

Clues are given in the form of black and white pegs, black signifying that a colour is correct and in the right position, white signifying that a colour is correct but in the wrong place. In this version, the Dragon chooses the colours at random. Up to ten people can play and "pegs" are selected by pressing the initial letter of the colour — red, blue, green, yellow orange or magenta.

If one of the first three pegs has been placed and the player wishes to change his mind, the black arrow will delete the previous entry. A maximum of eight guesses is kept. If there is more than one player, running score totals are kept and displayed after each game.

Program notes

Lines 10 to 50 set up the game, taking the number and names of the players and, ▶

if required, branching to the instructions displayed in lines 1000 to 1130. Note that the black arrow in line 1060 is printed by typing shift ↑. Lines 60 to 100 increment the player number and set up the board ready for play. Line 200 chooses four colours at random.

The P = PEEK(275) . . . NEXT in line 50 ensures that the same "random" numbers are not chosen in each first game after the computer is switched on. In fact, the Dragon knows the colours only by number (1 to 6). The CHR$ code for each "peg" is found in the array B(6) read in from the data in line 5000.

The initial letters are decoded by the INSTR function which searches through the string C$, "RBGYOM". One player, not being accustomed to the Dragon's colours, preferred to call magenta "pink". This can be changed by amending line 50 to read . . . C$ = "RBGYYOP" . . . and by amending the instructions in lines 1010. 1060 and 1120.

Lines 250 to 270 allow the player to key in the initial letters and the Dragon to place the colours on the board. Next, the computer checks the colours for a match, black pegs selected in line 280, white pegs in lines 300 to 350.

Line 290 checks whether all clue pegs are black, in which case the program passes to the finish routine at line 460. Line 360 increments the line number if this is less than 15 (the eighth turn). If it is not, the program continues to lines 400 to 430 where the player's guesses are condensed and the solution displayed. Lines 440 to 490 give comments and scores.

```
1  '***************************
2  '**    DRAGON MASTERMIND   **
3  '** WRITTEN BY ALAN FYFE **
4  '***************************
5  '
9  '**INTRODUCTION**
10 CLS0:PRINT@234,CHR$(191);:PLAY"
D":PRINT@238,CHR$(175);:PLAY"E":PR
INT@242,CHR$(143);:PLAY"C":PRINT@2
46,CHR$(159);:PLAY"O2C":PRINT@427,
"MASTERMIND";:PLAY"L2.G"
20 FOR Z=1TO800:NEXT:CLS:PRINT@75,
"MASTERMIND":PRINT@162,"DO YOU REQ
UIRE INSTRUCTIONS?"
30 I$=INKEY$:IF I$="" THEN 30 ELSE
 IF I$="N" THEN 40 ELSE IF I$="Y"
THEN 1000 ELSE SOUND120,1:GOTO 30
40 PRINT:PRINT:INPUT"  HOW MANY PL
AYERS";NP:IF NP>1 THEN PRINT:FOR I
=1TO NP:PRINT" NAME OF PLAYER";I;:
INPUT NA$(I):NEXT
50 P=PEEK(275):FOR Z=1TO P:I=RND(0
):NEXT:C$="RBGYOM":L$=STRING$(18,1
28)+STRING$(14,143):FOR I=1TO6:REA
D B(I):NEXT
60 CLS:FOR L=1TO15:PRINTL$;:NEXT:P
RINT STRING$(18,128);:IF Q=1 THEN
200
70 PN=PN+1:IF PN>NP THEN PN=1
80 IF NP>1 THEN PRINT@0,"  PLAYER"
;PN;"- ";NA$(PN)
90 PRINT@134,"guesses";:PRINT@151,
"CLUES";:PRINT@165,"displayed";:PR
INT@181,"DISPLAYED";:PRINT@197,"th
is";CHR$(128);"side";:PRINT@213,"T
HIS SIDE";
100 GOSUB 2000:Q=1:GOTO 60
200 Q=0:Y=1:FOR I=1TO4:A(I)=RND(6)
:NEXT:'**RANDOM COLOURS**
248 '
249 '**PLAYER CHOOSES COLOURS**
250 FOR I=1TO4
260 B$(I)=INKEY$:IF B$(I)="" THEN
260 ELSE IF ASC(B$(I))=8 AND I>1 T
HEN I=I-1:PRINT@(Y*32+I*3),CHR$(12
8);:GOTO 260 ELSE IF INSTR(1,C$,B$
(I))=0 THEN SOUND120,1:GOTO 260
270 G(I)=INSTR(1,C$,B$(I)):PRINT@(
Y*32+I*3),CHR$(B(G(I)));:NEXT
278 '
279 '**DRAGON CHECKS COLOURS**
280 P=0:FOR I=1TO4:IF A(I)=G(I) TH
EN K(I)=1:PRINT@(Y*32+20+P),CHR$(1
28);:P=P+3:NEXT ELSE K(I)=0:NEXT
290 IF (K(1)+K(2)+K(3)+K(4))=4 THE
N PLAY"O3L8CEGBO4L4C":FOR Z=1TO800
:NEXT:GOTO460
300 FOR I=1TO4:L(I)=K(I):NEXT
310 FOR I=1TO4:IF K(I)=1 THEN 350
320 FOR J=1TO4:IF L(J)=1 THEN 340
330 IF G(I)=A(J) THEN L(J)=1:PRINT
@(Y*32+20+P),CHR$(207);:P=P+3:GOTO
 350 ELSE L(J)=0
340 NEXT J
350 NEXT I
360 IF Y=15 THEN 400 ELSE Y=Y+2:GO
TO 250
398 '
399 '**TOO MANY GUESSES**
400 FOR I=2TO8:FOR J=1TO10 STEP3:P
OKE(1026+32*I+J),(PEEK(1026+64*I-3
2+J)):POKE(1043+32*I+J),(PEEK(1043
+64*I-32+J)):NEXT J,I
410 FOR I=32TO192 STEP64:PRINT@256
+I,L$;:NEXT:PRINT@480,STRING$(18,1
28);STRING$(12,143);
420 FOR I=1TO4:PRINT@(384+I*3),CHR
$(B(A(I)));:NEXT:PRINT@402,"= THE
ANSWER";
430 GOSUB2000
440 Y=16:CLS:PRINT@100,"POOR SHOW
";NA$(PN):PRINT@164,"YOU SCORED ZE
RO":IF NP=1 THEN 480
450 GOTO 470
458 '
459 '**PLAYER GUESSES RIGHT**
460 CLS:PRINT@100,"WELL DONE ";NA$
(PN):PRINT@164,"YOU SCORED";16-Y:I
F NP=1 THEN 480
470 SC(PN)=SC(PN)+16-Y:PRINT@228,"
THE SCORES ARE NOW:":FOR I=1TO NP:
PRINT@(260+I*32),NA$(I);:PRINT@(26
8+I*32),SC(I):NEXT
480 IF NP=PN THEN PRINT:PRINT"
ANOTHER ROUND?" ELSE PRINT:PRINT"
   PRESS <ENTER> TO CONTINUE"
490 I$=INKEY$:IF I$="" THEN 490 EL
SE IF I$="Y" THEN 60 ELSE IF I$="N
" THEN END ELSE IF ASC(I$)=13 THEN
 60 ELSE SOUND120,1:GOTO490
998 '
```

Continued on page 38

```
999 '**INSTRUCTIONS**
1000 PRINT@129,"MASTERMIND IS A GA
ME OF LOGIC   AND DEDUCTION.  THE
AIM IS TO   FIND THE COLOURS OF FO
UR SPOTS  BY TRYING TO DUPLICATE T
HEM."
1010 PRINT:PRINT" THERE ARE SIX PO
SSIBLE COLOURS  - RED, BLUE, GREEN
, YELLOW,      ORANGE AND MAGENTA.
ANY COLOUR  MAY BE USED MORE THAN
ONCE AND  THEY CAN BE PUT IN ANY O
RDER."
1020 GOSUB 2000
1030 CLS:PRINT:PRINT" THE PLAYER H
AS TO GUESS WHAT     COLOURS HAVE B
EEN USED AND THE  ORDER IN WHICH T
HEY ARE PLACED. AFTER EACH GUESS,
CLUES ARE      GIVEN IN THE FORM OF
 BLACK AND  WHITE SPOTS."
1040 PRINT:PRINT" A WHITE SPOT IND
ICATES THAT A   COLOUR IS CORRECT
AND A BLACK   SPOT MEANS THAT THE
COLOUR IS   ALSO IN THE RIGHT PLAC
E."
1050 GOSUB 2000
1060 CLS:PRINT:PRINT" COLOURS ARE
ENTERED BY TYPING   THEIR INITIAL
LETTER - R,B,G,Y  O OR M. THEY CAN
 BE REMOVED BY  TYPING THE _ ARROW
 (UP TO WHEN  THE LAST SPOT IS GUE
SSED)."
1070 PRINT:PRINT" THE MAXIMUM NUMB
ER OF GUESSES   IS EIGHT. A SCORE
BASED ON THE  NUMBER OF GUESSES WH
ICH WERE    NEEDED IS GIVEN AFTER
THE GAME."
1080 PRINT" THE SIX COLOURS ARE SH
OWN ON    THE NEXT PAGE";
1090 GOSUB 2000
1100 CLS0:PRINT@74,"R";:PRINT@79,C
HR$(191);:PRINT@84,"RED";:PRINT@13
8,"B";:PRINT@143,CHR$(175);:PRINT@
148,"BLUE";
1110 PRINT@202,"G";:PRINT@207,CHR$
(143);:PRINT@212,"GREEN";:PRINT@26
6,"Y";:PRINT@271,CHR$(159);:PRINT@
276,"YELLOW";
1120 PRINT@330,"O";:PRINT@335,CHR$
(255);:PRINT@340,"ORANGE";:PRINT@3
94,"M";:PRINT@399,CHR$(239);:PRINT
@404,"MAGENTA";
1130 GOSUB 2000:CLS:GOTO 40
1998 '
1999 '**SPACEBAR SUBROUTINE**
2000 PRINT@480," PRESS SPACEBAR TO
 CONTINUE...";
2010 I$=INKEY$:IF I$="" THEN 2010
ELSE RETURN
4998 '
4999 '***** DATA *****
5000 DATA 191,175,143,159,255,239
```

Hangman

From Norman Paul Kelly in Gateshead

THE ENCLOSED program runs on any Dragon 32 and uses about 6K RAM. It is a basic simulation of the game "Hangman" and must be played by two players.

On running the program the computer prompts the first player to enter a word or string of words which the second player must try and guess. On entering the word(s) the first player is then prompted to enter a clue as to what the word is. Once this has been done the normal rules for Hangman apply. That is, if the second player guesses a letter correctly then the space occupying the position of the letter is filled in with the letter guessed. If the second player guesses incorrectly then the building of the gallows commences. If the second player wins the round then the program adds one point on to their score and then asks them to choose a word for the first player. On the other hand if the second player loses the round then they also lose the point and the first player is again asked to choose a word.

This game leaves plenty of room to enable it to be expanded, possibly by holding a data file of words and clues which could be read in before the first run of the program.

```
10 REM **************
20 REM * HANGMAN BY *
30 REM * PAUL KELLY *
40 REM *  25/09/83  *
50 REM *DRAGON  USER*
60 REM **************
70 DIM GR$(11):DIM PY(2):DIMDA$(9)
80 CLEAR2000:GOSUB 700
90 PL=1
100 REM ** COVER **
110 PMODE4,1:PCLS0:SCREEN1,1
120 LINE(166,108)-(192,92),PSET,BF
130 DRAW"BM28,32;D12BU6R6BU6D12BR4
U11E1R4F1D11BU6L6BD6BR10U12BD2F6BU
8D12BR6R4BE1U3BL1R2BL1BU4U3H1L4G1D
10BD1BR10"
140 DRAW"U12BD2F2R2E2BU2D12BR4U11E
1R4F1D11BU6L6BD6BR10U12BD2F6BU8D12
"
150 LINE(24,51)-(99,26),PSET,B
160 DRAW"BM191,62;D30R1U30L25BR18F
7BU6L25D5R1F1D1G1L2H1U1E1R1":FOR I
=1 TO 200: NEXT I:SOUND200,1:DRAW"
BD4BL1R2D1R3D1BL8":FOR I=1 TO 200:
NEXT I:SOUND150,1:DRAW"U1R3":FOR I
=1 TO 200:NEXT I:SOUND100,1:DRAW"D
4L1D4R1U4":FOR I=1 TO 200:NEXT I:S
OUND50,1
170 DRAW"R2D4R1U4L1U4"
180 PLAY"T16;O2;L1AL1AL4AL1AO3L1CO
2L4BL1BL4AL1AL4AL1A"
190 FOR I=1 TO 500:NEXT I
200 RE$=" ":RE=0:C=0:CH=0:FL=0:LF=
0
210 SCREEN0,1:CLS0
220 IF PL=1 THEN PL$="one" ELSE PL
$="two"
230 CH$=CHR$(128)
```

Continued on page 41

```
240 PRINT@2,"player";CH$;"one";PY(
1);:PRINT@18,"player";CH$;"two";PY
(2);:PRINT@64,"player";CH$;PL$;CH$
;:POKE1099,58:POKE1100,45:
250 PRINT@450,"player";CH$;:IF PL$
="one"THENPRINT"two";CH$;ELSE PRIN
T"one";CH$;
260 PRINT"please";CH$;"look";CH$;"
away";
270 PRINT@77,CH$;"type";CH$;"in";C
H$;"word";:PRINT@96,"";:LINEINPUT
WO$:FORI=(98+LEN(WO$)) TO 127:PRIN
T@I,CH$;:NEXT I
280 PRINT@160,"please";CH$;"type";
CH$;"in";CH$;"clue";
290 PRINT@192,"";:LINEINPUT CL$:FO
R I=(194+LEN(CL$)) TO 255:PRINT@I,
CH$;:NEXT I
300 IF PL=1 THEN P=2 ELSE P=1
310 CLS:SCREEN0,1:PRINT@34,"PLAYER
 ";P;" HERE IS THE CLUE :-":PRINTT
AB((INT(32-LEN(CL$)))/2);CL$
320 GOSUB 550
330 IF C=1 THEN C$=CHR$(32): GOSUB
 600
340 PRINT@226,"CHARACTERS USED:-";
RE$;:PRINT@162,"TYPE IN CHARACTER
:-";:C$=INKEY$:PRINT@183,C$;:IF C$
="" THEN GOTO340
350 GOSUB 570
360 IF FL=0 THEN LF=LF+1 ELSE LF=L
F
370 IF FL=0 THEN GOSUB 420
380 IF CH=LEN(WO$) THEN GOTO 630
390 IF LF=10 THEN GOTO 680
400 REM PUT CHECK FOR HANGING HERE
410 PRINT@179,"   ";:FL=0:GOTO 340
420 PMODE3,1:PCLS:SCREEN1,0:COLOR3
,3
430 LINE(140,154)-(196,128),PSET,B
F
440 FOR I=0 TO LF:DRAWGR$(I):SOUND
 100,1:SOUND 100,1:NEXT I:IF LF=10
 THEN PAINT(144,98),4,3
450 IF LF<5 THEN 520 ELSE PAINT(14
2,87),2,2:PSET(142,87,3):PSET(146,
87,3):DRAW"BM143,89;C4;F1R1E1":IF
LF=10 THEN GOTO 490
460 IF LF=>8 THEN DRAW"BM8,28;S8"+
DA$(7)+DA$(1)+DA$(9)+"BR4"+DA$(9)+
DA$(4)+DA$(8)+DA$(6)
470 IF LF=>8 THEN DRAW"BR4"+DA$(5)
+DA$(6)+DA$(1)+DA$(9)+DA$(3)+DA$(6
)+DA$(7)+"S4"
480 IF LF<>10 THEN 530
490 IF LF=10 THEN DRAW"BM8,28;S8"+
DA$(7)+DA$(4)+DA$(6)+DA$(6)+DA$(9)
+"BR4"
500 DRAWDA$(9)+DA$(4)+DA$(8)+"BR2"
+DA$(6)+DA$(3)+"BR4"
510 DRAW DA$(2)+DA$(3)+DA$(1)+DA$(
2)+"S4"
520 IF LF<>10 THEN 530 ELSE PLAY"V
31;T6;O2;L1AL1AL4AL1AO3L1CO2L4BL1B
L4AL1AL4AL1A"
530 FOR DE= 1 TO 1000:NEXT DE
540 RETURN
550 FOR W=1 TO LEN(WO$):LET M$=MID
$(WO$,W,1):IF M$<>" " THEN PRINT@4
20+W,"=";ELSE PRINT@420+W," ";:C=1
560 NEXT W:RETURN
570 FL=0:FOR I=1 TO LEN (RE$):IF C
$<>MID$(RE$,I,1) THEN 590 ELSE FL=
1
580 IF FL<>1 THEN FL=0
590 NEXT I:IF FL=1 THEN RETURN
600 FL=0:FOR I=1 TO LEN(WO$):IF  C
$<>MID$(WO$,I,1) THEN 610 ELSE FL=
1:CH=CH+1:PRINT@388+I,C$;:GOTO 620
610 IF FL<>1 THEN FL=0
620 NEXT I:RE$=RE$+C$+",":RETURN
630 PRINT@324,"WELL DONE ANOTHER G
AME?";:PY(P)=PY(P)+1:DU=PL:PL=P:P=
DU
640 PLAY"T11O2L3FGEL1FL3FGEL1FL2T9
FL3F#L2GL3G#L1T6A"
650 I$=INKEY$:IF I$="" THEN GOTO 6
50
660 IF I$="Y" THEN PLAY"T16O2L3FGE
L1FL3FGEL1FL2T14FL3F#L2GL3G#L1T16A
":GOTO200
670 IF I$="N" THEN PLAY"O1FL2C":CL
S:END
680 PRINT@324,"YOU LOST.THE WORD W
AS ";:PRINT@389,WO$;:PRINT@489,"AN
OTHER GAME ?";:PY(PL)=PY(PL)+1
690 GOTO 650
700 DATA C2;U60L1D60L1U60
710 DATA L50D1R50BL10
720 DATAF10BH10BL40
730 DATA D15
740 DATA R2F3D2G2L4H2U2E2R2BL2BD7R
4BL4BD1
750 DATA C3;L6C2L2D2R2C3U2D2R6D4R4
BL4
760 DATA C2;D8C4;L2D1R2U1C2U8R3D1L
3D1BR3L3U2R
770 DATA R2D8C4D1R3U1L2C2;U8BL4R4
780 DATA C3;L4R4U4R6C2;R1U2L1C3;D2
U2L8
790 'CHARACTER DATA'
800 DATA NRU4R4D3NL3DBR2,RNR2NU2LU
4R3FD2BDBR2
810 DATA NR4UNRUNR4U2R4BD4BR2,RNU2
LU4R4D4NL4BR2
820 DATA NRUNR4U3R4D3BDBR2,RNU2LU4
R4D2L2F2BR2
830 DATA R3NURU2L4U2R4BD4BR2
840 DATANU4RNU2R3NU4BR2,BU2U2RD2R3
NU2D2BR2
850 FOR I=1 TO 9:READ GR$(I):NEXT I
860 FOR I=1 TO 9:READ DA$(I):NEXT
I
870 RETURN
```



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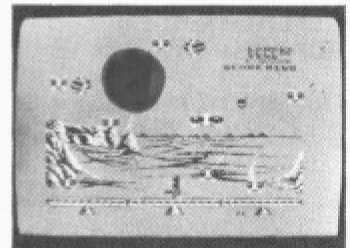
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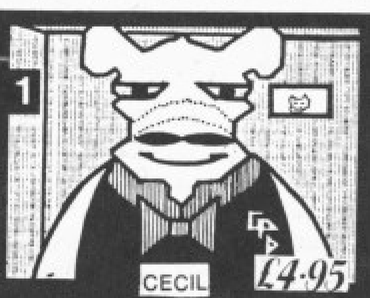
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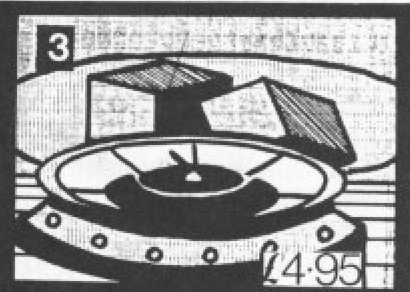
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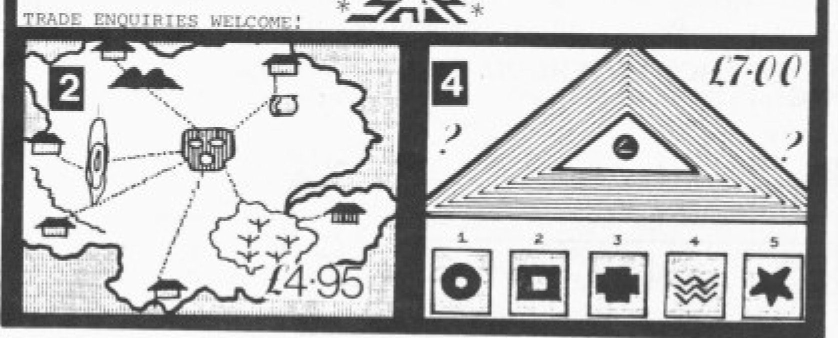
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A BUMPER month for Dragon adventurers, who can at last feel they're coming in out of the cold with the arrival not only of the first of the Mysterious Adventures series, **The Golden Baton**, but also the first Scott Adams adventure seen on our machine, **The Incredible Hulk**. The incredible graphics are missing on this one, though The Golden Baton comes in versions for the Dragon 32 and 64 on the one tape, the 64 having graphics that can be toggled on and off by pressing the Enter key.

This is a useful feature that applies to versions of this series for other machines: the graphics are adequate rather than stunning, and personally I prefer to play the text-only versions once I've had a quick look at the pictures. Not that the text in these helps conjure up vivid scenes in the way that some adventures do. They tend to be matter-of-fact, the opening description being, "I'm in a dense spooky forest. I can see: Old Cloak — Rotting Leaves. Exits: north, south."

One thing we can be thankful for is that someone has decided to redefine the character set into small, neat text with lower-case, which is very pleasing on the eye. I wish all Dragon adventures were done like this, though unfortunately it does nothing to improve the machine's keyboard response and you still have your typical commands like "EXM BARRL" and "GT CNDLE" if you're too nimble with the typing digits.

What this series doesn't go in for is red herrings, so you can be sure that every object you find will have a purpose . . . eventually. Something you do need to remember is the difference between the two commands "EXAMINE" and "SEARCH". Examine suggests a visual check of an object, whereas a more thorough Search might reveal something hidden beneath or inside.

The initial locations are all in and around the forest, one path being blocked by a savage wolf. Finding the means to deal with this isn't too difficult, though I haven't yet figured out what use a dead wolf is in the scheme of things.

The adventure is in three stages, and once you've explored the outdoors there is a castle to try to enter, which leads to the Gorgon room (where a knowledge of Greek mythology might come in useful) and then finally on to the search for the Golden Baton itself which is via one of the earlier forest locations.

The Baton is to restore peace on your lands, if you are interested, and the adventure itself is tricky and intriguing, if lacking something in atmosphere. There are no silly "Sudden Death" routines, you always seem to be given fair warning if something nasty is about to happen, so you can retreat and think again, and I'd certainly recommend this to the Dragon adventure addict.

It's an expensive month for recommendations, as your first chance to sample a Scott Adams title shouldn't be missed either. It's a pity his own series of adventures isn't yet available . . . though considering the problems I'm having with The Incredible Hulk maybe that's just as well at the moment. The opening scene doesn't leave much room for manoeuvre, being a very stark: "I'm Bruce Banner, tied hand and foot to a chair . . . What shall I do?" Obviously you need to turn into the Hulk, and a read through the accompanying leaflet suggests how this might be achieved. In fact at the end you're given coded clues if you're really stuck in that first scene, though I can assure you there's at least one other command that will help you escape.



The adventure is littered with signs to read, and one of these informs you that the purpose of the adventure is simply to collect as many gems as you can and return them to a certain place . . . which you discover by reading yet another sign. To get there, though, you have to get out of the dome where you have been imprisoned. As Bruce Banner you will be killed by rocks in the tunnel leading out, so again you have to find a means of turning into the Hulk.

An example of the Scott Adams style of humour comes in a field where, if you wait around too long, alien army ants emerge from holes to attack your eyes and kill you, even as the Hulk. Next time round you try to be smart and enter "CLOSE EYES", only to find that they attack your nose instead.

Scott Adams' technique is not to go in for the type of adventure with two hundred locations and more, but to restrict the numbers of places and concentrate instead on the deviousness of the tasks to be solved. Once out of the dome you are in a field, and whichever way you move from here takes you to a fuzzy area. North of here is a small underground room which contains both a gem and an egg. If you try to take the gem then the egg explodes and kills you, as the earlier technique of turning into the Hulk doesn't work here, so you're puny Bruce Banner instead.

If you hang around trying to figure out tactics the room eventually fills with poison gas and you die . . . or rather, in the Scott Adams tradition, you are transported to Limbo and can start again with the game state as it was. If you want to start from scratch you must "QUIT", and naturally there's a "SAVE" facility.

Another sample of the problems you'll get is in the very first location where, once you've escaped, various items are revealed to you including a large iron ring set in the floor. It won't budge if you try to move it, and again you're Bruce Banner, with no apparent means of turning back into the Hulk in this location once you've escaped from the chair. You can become the Hulk in the next location, but return to this room and you're Banner again . . . it's all to do with these strange gasses, you understand.

The adventure has a vocabulary of some 120 words, and like The Golden Baton the commands are in the usual two-word form, both adventures accepting abbreviations of the first four letters of a word.

Both adventures are well-packaged and documented, and I'm sure you'll get your money's worth from both. **The Golden Baton** is available from Channel 8 at 51 Fishergate, Preston, Lancs PR1 8BH (price £9.95), and **The Incredible Hulk** from Adventure International, 119 John Bright Street, Birmingham (£7.95). ■

Each month Mike Gerrard will be looking at adventures for the Dragon. If you have an adventure you want reviewed or you need advice or have some to offer write to Mike Gerrard's Adventure Trail at *Dragon User*.

If you've got a technical question write to Brian Cadge. Please do not send a SAE as Brian cannot guarantee to answer individual inquiries.

Dragon Answers

Down in the dumps

LAST MONTH I purchased a Microline 80 printer for my Dragon. Is it possible to "dump" an entire screen full of either text or graphics (hi-res or low-res) straight onto paper?

Also, I wish to buy a colour monitor for my Dragon. Could you advise me of any possible suppliers and prices?

David Maren
Tamworth
Staffs

THE PROBLEM here is that to my knowledge the Microline 80 printer is not capable of producing high resolution graphics and so a screen dump is not possible.

Caveman Computers can supply a screen dump for the Seikosha GP100A and DMP 100 for £7.95 from Windy Nook, Gateshead, Tyne and Wear. Cheaper are source code tapes at £5.99 for dumps to the above printers and the Epson from Compusense, Box 169, Palmers Green, London.

Direct Electronic Displays can provide a JLC 14 inch colour monitor with necessary leads for the Dragon for £207 including post and packing. This monitor also handles the Dragon's sound output. It is available from Unit 7, 551a High Road, London N17 or telephone them on 01-808 8847.

Sweet dreams

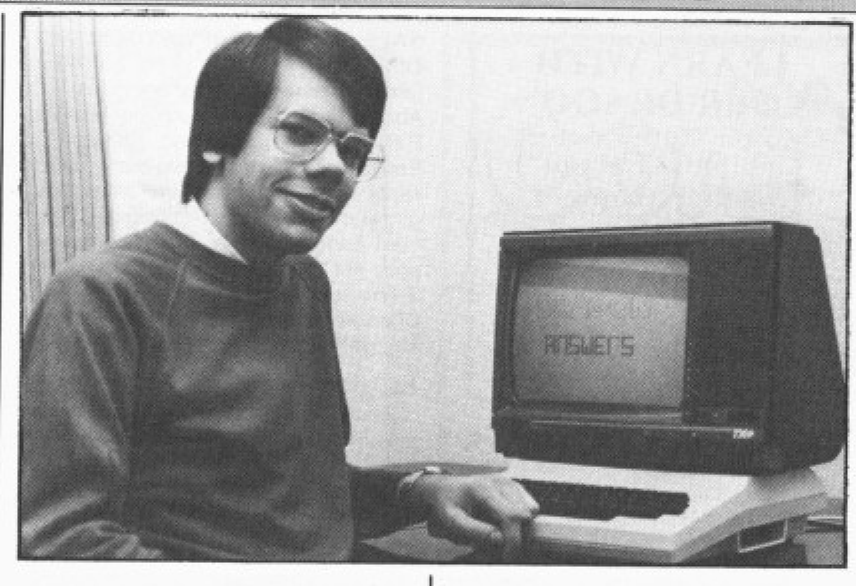
I HAVE a Dream cassette, but the Dream program won't save my assembler programs on to tape. My Dixon TR30 cassette recorder has given me no difficulty prior to this. Can you tell me what the problem is?

Dorothy Lowther
Bardsey
Leeds

THE problem with the Dream assembler program is that it resets the cassette header tone length to only 4 bytes. This can cause problems with some cassette recorders, especially those with automatic level control. The solution is quite simple, but it does result in programs taking longer to save and load.

Assuming Dream has been loaded at its usual position starting at 20001, before EXECing the program type the following:
POKE 29788, 215 : POKE 29789, 145

This should prevent any further problems with I/O errors using Dream.



Joyless Joysticks

WHEN I have my joystick connected to my computer the keys will not work. Should this happen, and if so could you tell me what to do about it because this is the second Dragon that I have had.

Gordon Matkin
Derby

THIS PROBLEM is almost certainly due to your joysticks and not your Dragon. The most likely fault is that the fire button is short circuiting, preventing the keyboard from being scanned properly. Try using some different joysticks, or your joystick on a different Dragon.

Break key disabled

COULD you please tell my why, after typing in the poke numbers for disabling the break key, I am still able to break into my programs when it comes to an input command?

I have checked the poke number and found no errors. Surely, these poke numbers are not very good if when my programs come to an input command I am unable to press break. Could you please tell me how to disable the break key when it comes to an input command.

Jurgen Mitchell
W Yorkshire

THE method which is widely used to disable the break key does not take into account input lines. The main advantage of this method is that it is short and easy to enter.

A better method of disabling the break key which does take into account commands like INPUT A$ is the program listed here. This program has the disadvantage of being somewhat longer, but it does the job and can be used with the LIST disable routine published previously (*Dragon User*, June 1983) if required.

```
5 DISABLE BREAK KEY
  (INC INPUT LINES)
10 CLEAR200,32550
20 FORI=0 TO 55:READA$:
   POKE 32551+I,VAL("&H"+
   A$):NEXT
30 DATA 8E,7F,3C,BF,01,6B,
   8E,7F,54,BF,01,9B,86,7E,B7,
   01,6A,B7,01,9A,39,0D,6F,
   27,01,39,32,62,34,14,BD,
   80,09,BD,80,06,27,F8,81,03,
   27,F4,7E,B5,42,9F,DF,35,10,
   30,04,34,10,9E,DF,39
40 EXEC 32551
```

High-res savings

I AM able to save low resolution pictures as a block on tape but I have tried to save high resolution pictures and have had no luck. Please could you tell me if it is possible to save high resolution graphics as a block on tape and if so how.

M Backshall
Bucks

IT IS possible to save high resolution graphics to tape, in a similar manner to saving low res screens. However, you need to check how much memory the mode you are in uses. For example, Pmodes 3 and 4 use 6K of memory, whilst Pmodes 1 and 2 use 3K. To save a screen starting at graphics page one in either mode 3 or 4 type:
CSAVEM "PIC", 1536, 7679, 33649
and for modes 1 or 2 type:
CSAVE "PIC", 1536, 4607, 33649

To reload the screens later use CLOADM "PIC".

Accessing m/c routines

COULD you please let me know if it is possible to access any of the machine code routines in ROM or in Dos to record or read files to/from disk, from a machine code program. These files contain only hexa-code in the RAM.

André Portier
Paris

THE routines you need are stored in the DragonDos ROM. The following locations need to be set up before calling the routines:

235 = Disk track (0—39)
237 = Disk sector (1—18)
238/39 = Address of data to be saved, or address to which data is loaded.

Then call the following routines:
JSR 49409 to save a sector to disk
JSR 49412 to load a sector from disk.

Take that!

I AM attempting to write a "Joust" type program using Basic. Could you please explain how I can produce a "brake" type sound effect which would not affect the program running.

M Treavor
Berfleet
Essex

USING Basic it is not possible to mix sound and moving graphics at the same time. A "Brake" or "Skid" type of sound can be made from Basic using the Play command with a very high tempo. The following will give the desired effect:
PLAY "05;V31:L255;T200;AAAAAAAA;T50;AAAA;T25;AAA;T5;AA"

If you split this up into several Play commands and move the graphics between each you can get the effect of moving graphics and sound at the same time.

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BASICODE skilled and friendly machine code programmers on the Dragon wanted to join our team of advisers helping BASICODE users by telephone. Working from home evenings and weekends, September-December. £5 per hour. For further details write to BASICODE, Helpline, PO Box 7, London W3 6XJ.

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Competition Corner

Answers to Competition Corner, *Dragon User*, 12/13 Little Newport Street, London WC2R 3LD



Searching for squares

*Complete **Gordon Lee's** grid to win £200 of Salamander's software*

THE MAY competition brought in some very interesting entries for the "Prime-search" problem. Readers were invited to compile a six-by-six grid of digits which was to contain as many different primes as possible. The primes could be read up or down, from the left or right or diagonally — with the only restriction being that the four digits 1, 9, 8 and 4, already in place on the grid, were to be left in position.

This last point was a condition that some entrants failed to realise and, of course, these entries had to be disqualified. Other replies also had to be eliminated for inaccurately listing the number of primes present — either by duplicating the same primes or including non-primes on the lists. In two cases, this was particularly unfortunate, as both entries would have been potential winners, having scored higher targets than the eventual prizewinner.

Prime search

This "prime-search" competition was unusual in that there was no absolutely correct answer — just the highest possible score obtainable to decide the winner.

In compiling the problem, the highest score that I managed was 87, and so I reckoned that a score of one hundred or over would be pretty good going. The highest score received had achieved an amazing 150 primes, with the runner-up close on his heels with 146, although, as has been stated, both of these entries had to be eliminated. This was a difficult decision, but it was decided that in fairness to entrants who had submitted *accurate* answers, these entries should be disallowed. To quote from W S Gilbert: "... virtue is triumphant only in theatrical performances."

Nevertheless, a score of 150 certainly deserves recording so, if anyone would like to try to improve on this record, here is the grid in question:

3	3	7	1	9	9
7	1	6	3	8	9
9	1	9	4	2	1
3	9	1	8	7	3
4	3	9	7	4	9
9	3	3	7	3	1

Don't forget that the terms of the question require that the four digits 1, 9, 8 and 4 be placed in the centre four positions of the top-left to bottom-right diagonal.

The theory of constructing a prime-search grid is particularly involved. The natural tendency of avoiding all even digits and fives is in itself restricting, as only a small portion of the primes are made up solely from these digits. So, the judicious introduction of a few even digits would seem to be a better move than their complete avoidance, but exactly which, and how many, makes for a difficult, if near impossible analysis.

This months competition also involves completing a grid, although this time, the object is to produce as many different squares as possible.

	2			3	
	7			8	

The numbers can read in any direction — up, down, left to right, right to left, or diagonally, but only in a straight line. For example, the sequence 90225 would contain the squares 9,225 and 25 in one direction, and the square 2209 in reverse. Remember that the four digits already on the grid must be left in place. Note that in listing your squares, any square can only be counted once, even though it may appear in the grid several times.

To enter the competition, copy your completed grid on to a sheet of paper and then list clearly all the squares that you have found. You must show how you arrived at the answer with the use of a Basic program. At the top of the page state the total number that you are claiming. The winner will be the entrant with the highest score.

Prize

SALAMANDER is offering readers a chance to win its entire range of software for the Dragon.

Popular titles include the somewhat bizarre Cricklewood Incident, the best-selling Dan Diamond trilogy, Red Meanies, turtle graphics and a data retrieval system.

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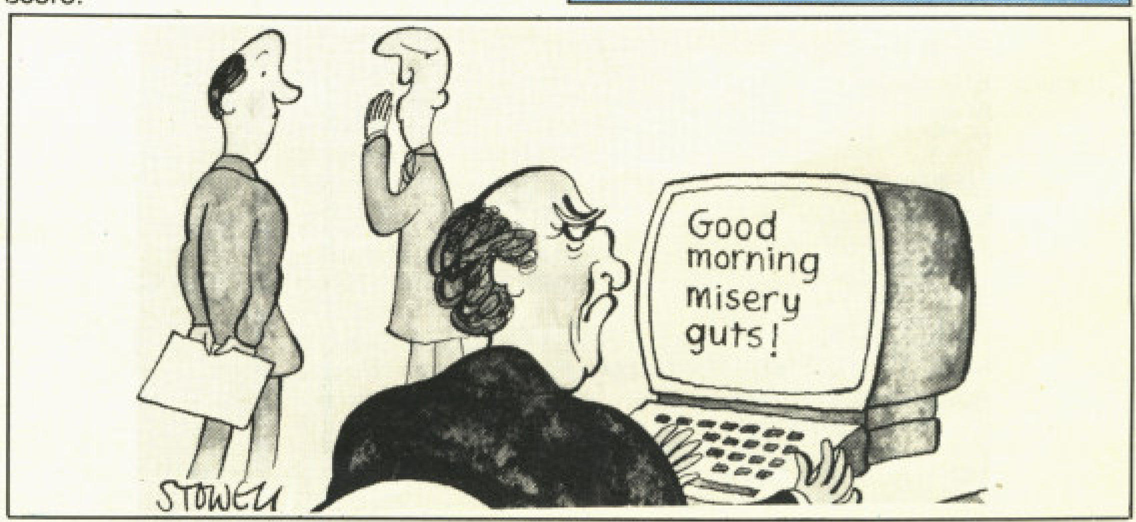
TO WIN the software you must show both the answer to the competition and how to solve it with the use of a Basic program developed on your Dragon. Please do not send in a cassette containing the answer. As a tie-breaker complete the following sentence in 15 words or less: "I want Salamander's range of software for my Dragon because . . ."

Your entry must arrive at *Dragon User* by the last working day of October. The winner and the solution to the quiz will be published in our January issue. Entries will not be acknowledged and we cannot enter into correspondence on the result. You may only enter the competition once.

July winner

THE WINNER of July's competition and recipient of a HR-5 thermal transfer printer from Brother is Mrs Katherine Mayer of Roath in Cardiff.

Katherine correctly gave the 18 states that were on the professor's list.



St. George now has two choices!

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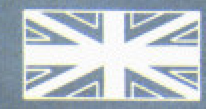
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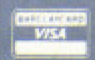
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